General information

Wellbore name	25/11-21 S
Type	EXPLORATION
Purpose	APPRAISAL
Status	P&A
Factmaps in new window	link to map
Main area	NORTH SEA
Field	GRANE
Discovery	25/11-15 Grane
Well name	25/11-21
Seismic location	NH 9301- ROW 1405 & COLUMN 1750
Production licence	169
Drilling operator	Norsk Hydro Produksjon AS
Drill permit	832-L
Drilling facility	TREASURE SAGA
Drilling days	22
Entered date	23.10.1995
Completed date	14.11.1995
Release date	14.11.1997
Publication date	20.03.2003
Purpose - planned	APPRAISAL
Reentry	NO
Content	OIL
Discovery wellbore	NO
1st level with HC, age	PALEOCENE
1st level with HC, formation	HEIMDAL FM
Kelly bushing elevation [m]	26.0
Water depth [m]	129.0
Total depth (MD) [m RKB]	1957.0
Final vertical depth (TVD) [m RKB]	1889.5
Maximum inclination [°]	27.9
Bottom hole temperature [°C]	72
Oldest penetrated age	LATE CRETACEOUS
Oldest penetrated formation	HOD FM
Geodetic datum	ED50
NS degrees	59° 9' 43.43'' N
EW degrees	2° 27' 53.07'' E
NS UTM [m]	6558372.45
EW UTM [m]	469391.49

UTM zone	31
NPDID wellbore	2701

Wellbore history

General

Well 25/11-21 S was drilled on the Grane Field. The primary objectives of well 25/11-21 S were to calibrate the depth conversion model with reference to top and base of the Grane reservoir and the oil-water contact, and to investigate horizontal and vertical reservoir barriers and reservoir heterogeneities. The secondary objectives of well 25/11-21 S were to obtain reservoir and fluid data and to investigate uncontaminated initial water saturation values in the oil zone. The well location was selected to allow building up hole angle for later drilling of a horizontal section (25/11-21 A) at the required depth and coordinates and at the same time to provide an accurate seismic tie, i.e. an area with minimal compaction effects and away from faults, in an area where there are indications of a thick sand on the seismic data.

Sidetrack well 25/11 -21 A was drilled to obtain 600 m to 900 m of horizontal reservoir information. The objectives were to appraise the reservoir in terms of reservoir quality and to confirm the structural top and base reservoir maps; to obtain lateral velocity information for calibration of the depth conversion model; to identify possible reservoir heterogeneities indicated on seismic; and finally to perform an extended test production in the horizontal section of the well.

Operations and results

Appraisal well 25/11-21 S was spudded with the semi-submersible installation "Treasure Saga" on 23 October 1995 and drilled to TD at 1957 m (1863.5 m TVD MSL) in Late Cretaceous Hod Formation. The well was drilled with seawater and hi-vis bentonite sweeps down to 1270 m and with KCl / Polymer mud from 1270 m to TD.

Heimdal Formation sand was penetrated at 1788 m (1711.5 m TVD MSL). A reservoir thickness of 88 m (79.5 m TVD) was defined, giving a net pay of 57.9 m. The pressure data from the Heimdal Formation indicates a 0.4 bar pressure difference to well 25/11-18 T2 and 1.7 bar difference to well 25/11-15 based on HP gauge measurements. The oil-water contact (FWL) in the well was found at 1765 m TVD MSL, i.e. more or less the same as in well 25/11-18-T2 and 2.5 meters deeper than in well 25/11-15. No free gas cap was found.& Both the top and base reservoir seismic reflectors and the depth conversion model were proven to be correct in the area, and the reservoir characteristics as found in wells 25/11-15 and 25/11-18 T2 were confirmed. A walk away VSP and walk away AVO VSP were acquired in well 25/11-21 S yielding good qualify high resolution data. The entire reservoir section was cored from 1778 m to 1880.5 m. The wire line logging programme was followed successfully except for an operational failure of the GHMT-tool. MDT Oil samples were taken at 1790 m (1713.09 m TVD MSL), 1796 m (1718.6 m TVD MSL), 1813 m (1734 m TVD MSL), 1828 m (1747.4 m TVD MSL), 1830 m (1749.4 m TVD MSL), 1837.5 m (1756.2 m TVD MSL), and 1845 m (1763 m TVD MSL). MDT water samples were taken at 1850 m (1767.5 m TVD MSL), 1855 m (1772.1 m TVD MSL), 1861.5 m (1777.9 m TVD MSL), and 1874 m (1789.2 m TVD MSL). Well 25/11-21 S was plugged back to the 13 3/8" casing shoe and suspended as an oil appraisal on 14 November 1995.

The well was re-entered with the semi-submersible installation "Treasure Saga" on 15 May 1996. Well 25/11-21 A was kicked of at 1262 m and drilled down to 1973 m in the Heimdal Formation. The hole was drilled with a too low angle to reach the 10 3/4" casing point within acceptable tolerances. Thus the hole was plugged back from 1973 m, and a

technical sidetrack, 25/11-21 A T2, was drilled from 1783 m, continued inclined to horizontal, and drilled to TD at 3006 m (1801.4 m TVD MSL) in the Late Paleocene Lista Formation. The sidetrack was drilled water based with KCl / Polymer mud from kick off to 2448 m and with CaCO3 / NaCl mud from 2448 m to TD.& In well 25/11-21 A T2, the top of the Heimdal Formation sand was penetrated at 1837.5 m (1705.7 m TVD MSL). At a depth of 1749 m TVD MSL a 820 m horizontal section was drilled. Here a 3 m thick calcite cemented layer, corresponding to an intra reservoir reflector, was penetrated at 2514.5 m. A deformed shaly zone, penetrated at 2627.5 - 2652 was probably due to drilling very close to top reservoir in this area. The Base of the Heimdal Formation was reached at 1765.7 m TVD MSL. The reservoir quality of the Heimdal sand is good, showing average porosities of 33%, and a general porosity increase from the SW towards the NE along the well path. The net to gross ratio of the Heimdal Formation is 0.98, due to the penetrated cemented and shaly zones. The oil-water contact (FWL) was found at 1765.6 m TVD MSL, confirming the results from the wells 25/11-21 S and 25/11-18 T2. The average oil saturation within the oil zone is 90%. Only MWD logs were obtained in the sidetrack. No wire line logs were run; consequently no fluid samples were taken on wire line. No conventional or sidewall cores were cut in the sidetrack. Well 25/11-21 A was suspended as an oil appraisal on 1 October 1996

Testing

No drill stem test was performed.

Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
1280.00	1957.00

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	1778.0	1785.2	[m]
2	1789.0	1807.7	[m]
3	1808.0	1826.8	[m]
4	1827.0	1846.0	[m]
5	1846.0	1865.7	[m]
6	1865.0	1874.9	[m]
7	1876.0	1880.5	[m]

Total core sample length [m]	97.8
Cores available for sampling?	YES

Core photos


1778-1783m


1783-1785m


1789-1794m


1794-1799m


1799-1804m


1804-1807m


1808-1813m


1813-1818m


1818-1823m


1823-1826m


1827-1832m


1832-1837m


1837-1842m


1842-1846m


1846-1851m


1851-1856m


1856-1861m


1861-1865m


1865-1870m


1870-1874m


1876-1880m

Palynological slides at the Norwegian Offshore Directorate

Sample depth	Depth unit	Sample type	Laboratory
1280.0	[m]	DC	RRI
1300.0	[m]	DC	RRI
1310.0	[m]	DC	RRI

1330.0	[m]	DC	RRI
1340.0	[m]	DC	RRI
1360.0	[m]	DC	RRI
1370.0	[m]	DC	RRI
1390.0	[m]	DC	RRI
1400.0	[m]	DC	RRI
1420.0	[m]	DC	RRI
1430.0	[m]	DC	RRI
1450.0	[m]	DC	RRI
1460.0	[m]	DC	RRI
1480.0	[m]	DC	RRI
1490.0	[m]	DC	RRI
1510.0	[m]	DC	RRI
1520.0	[m]	DC	RRI
1560.0	[m]	DC	RRI
1570.0	[m]	DC	RRI
1590.0	[m]	DC	RRI
1600.0	[m]	DC	RRI
1620.0	[m]	DC	RRI
1630.0	[m]	DC	RRI
1650.0	[m]	DC	RRI
1660.0	[m]	DC	RRI
1680.0	[m]	DC	RRI
1690.0	[m]	DC	RRI
1700.0	[m]	DC	RRI
1705.0	[m]	DC	RRI
1710.0	[m]	DC	RRI
1715.0	[m]	DC	RRI
1722.0	[m]	DC	RRI
1725.0	[m]	DC	RRI
1732.0	[m]	DC	RRI
1737.0	[m]	DC	RRI
1740.0	[m]	DC	RRI
1745.0	[m]	DC	RRI
1750.0	[m]	DC	RRI
1757.0	[m]	DC	RRI
1762.0	[m]	DC	RRI
1770.0	[m]	DC	RRI
1775.0	[m]	DC	RRI
1783.0	[m]	C	RRI

1877.0	[m]	C	RRI
1878.0	[m]	C	RRI
1879.0	[m]	C	RRI
1880.0	[m]	C	RRI
1887.0	[m]	DC	RRI
1890.0	[m]	DC	RRI
1895.0	[m]	DC	RRI
1900.0	[m]	DC	RRI
1905.0	[m]	DC	RRI
1910.0	[m]	DC	RRI
1915.0	[m]	DC	RRI
1920.0	[m]	DC	RRI
1925.0	[m]	DC	RRI

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
155	NORDLAND GP
648	UTSIRA FM
710	NO FORMAL NAME
796	HORDALAND GP
796	SKADE FM
978	UNDIFFERENTIATED
1000	NO FORMAL NAME
1028	UNDIFFERENTIATED
1074	NO FORMAL NAME
1087	UNDIFFERENTIATED
1102	NO FORMAL NAME
1115	UNDIFFERENTIATED
1221	NO FORMAL NAME
1230	UNDIFFERENTIATED
1723	ROGALAND GP
1723	BALDER FM
1734	SELE FM
1745	LISTA FM
1788	HEIMDAL FM
1876	LISTA FM
1890	VÅLE FM
1908	SHETLAND GP

1908	EKOFISK FM
1929	TOR FM
1947	HOD FM

Composite logs

Document name	Document format	Document size [MB]
2701	pdf	0.30

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

Document name	Document format	Document size [MB]
2701_25_11_21_S_COMPLETION_REPORT_AND_LOG	pdf	22.72

Logs

Log type	Log top depth [m]	Log bottom depth [m]
CMR MSFL GR ACTS	1257	1955
DLL MSFL DSI GR SP AMS	1257	1956
LDL CNL FMS GR AMS	1256	1956
MDT GR ACTS	1769	1874
MDT GR ACTS	1790	1790
MDT GR ACTS	1830	1855
MWD - GR RES DIR	155	1957
VSP	308	1940

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
SURF.COND.	30	218.0	30	218.0	0.00	LOT
INTERM.	13 3/8	1270.0	17 1/2	1270.0	0.00	LOT
OPEN HOLE		1957.0	8 1/2	1957.0	0.00	LOT

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
173	1.25			WATER BASED	
216	1.02			WATER BASED	
217	1.25			WATER BASED	
1051	1.02			WATER BASED	
1150	1.36	22.0		WATER BASED	
1270	1.25			WATER BASED	
1275	1.36	16.0		WATER BASED	
1748	1.36	15.0		WATER BASED	
1827	1.36	15.0		WATER BASED	
1876	1.36	19.0		WATER BASED	
1911	1.36	21.0		WATER BASED	
1957	1.36	21.0		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]
2701_Formation_pressure_(Formasjonstrykk)	pdf	0.19