

**General information**

Wellbore name	31/4-10
Type	EXPLORATION
Purpose	APPRAISAL
Status	P&A
Factmaps in new window	link to map
Main area	NORTH SEA
Field	BRAGE
Discovery	31/4-3 Brage
Well name	31/4-10
Seismic location	NH 9209- ROW 2078 & COLUMN 1224
Production licence	055
Drilling operator	Norsk Hydro Produksjon AS
Drill permit	829-L
Drilling facility	WEST VANGUARD
Drilling days	30
Entered date	14.11.1995
Completed date	13.12.1995
Release date	13.12.1997
Publication date	06.01.2014
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
2nd level with HC, age	MIDDLE JURASSIC
2nd level with HC, formation	FENSFJORD FM
Kelly bushing elevation [m]	22.0
Water depth [m]	234.0
Total depth (MD) [m RKB]	2350.0
Final vertical depth (TVD) [m RKB]	2342.0
Maximum inclination [°]	2
Bottom hole temperature [°C]	94
Oldest penetrated age	MIDDLE JURASSIC
Oldest penetrated formation	HEATHER FM
Geodetic datum	ED50
NS degrees	60° 37' 29.78" N
EW degrees	3° 11' 16.11" E



NS UTM [m]	6721185.71
EW UTM [m]	510277.82
UTM zone	31
NPDID wellbore	2617

Wellbore history

General

Well 31/4-10 was drilled to appraise the Brage Field on the Bjørgvin Arch in the North Sea. The main objective was to confirm hydrocarbons in the Sognefjord Formation. The secondary objectives were to obtain information about reservoir properties and stratigraphic development of the Fensfjord and Krossfjord Formations.

Operations and results

Appraisal well 31/4-10 was spudded with the semi-submersible installation West Vanguard on 14 November 1995 and drilled to TD at 2342 m in Middle Jurassic sediments in the Heather Formation. The well was drilled and logged without significant problems. It was drilled with spud mud down to 1010 m and with KCl/polymer mud from 1010 m to TD.

A 21 m thick Draupne Formation was penetrated from 2004 m to 2025 m. The Sognefjord Formation was encountered at 2025 m and a total of 4.7 m net pay was calculated in the interval between 2038.0 m and 2044.9 m. The average oil saturation over this interval is estimated to 50.6 %. The average porosity is calculated to 23 %. MDT pressure measurements gave an oil-water contact at 2045 m. Low saturations of residual hydrocarbons are observed in intervals below the oil-water contact down to bottom Sognefjord Formation at 2097.5 m. No gas-oil contact could be determined from pressure measurements or logs because of the low permeability over this interval. However, a gas-oil contact at 2034.5 m was inferred from hydrocarbon shows on the cores. The Fensfjord Formation was encountered at 2167.5 m and a total of 3.2 m net pay was calculated between 2167.5 m and 2171 m. MDT pressure measurements gave an oil-water contact at 2171 m. Low saturations of residual hydrocarbons are observed in intervals below the oil-water contact down to bottom Fensfjord Formation at 2217.5 m. The Krossfjord Formation was penetrated from 2269.5 m to 2277 m and was water bearing without shows.

Eleven cores were cut in the well. Cores 1 to 6 were cut from 2005 in the Draupne Formation, through the Sognefjord Formation and into the Heather Formation at 2114.6 m. One hundred percent recovery was obtained except for core 6, where only 46% recovery was obtained. Cores 7 to 11 were cut from 2171.5 m in the Fensford Formation to 2266 m in the Heather Formation. Good recovery was obtained. The recovery on core 11 included recovery of 3.9m from core 10 during running in hole with core 11. MDT oil samples were taken at 2038.5 m in the Sognefjord Formation and at 2168.7 m in the Fensfjord Formation.

The well was permanently abandoned on 13 December 1995 as an oil appraisal well.

Testing

No drill stem test was performed.



Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
1010.00	2350.00

Cuttings available for sampling?	YES
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Cores at the Norwegian Offshore Directorate

Core sample number	Core sample - top depth	Core sample - bottom depth	Core sample depth - uom
1	2005.0	2023.8	[m]
2	2023.8	2042.1	[m]
3	2042.1	2059.7	[m]
4	2059.7	2078.0	[m]
5	2078.0	2096.6	[m]
6	2096.6	2105.3	[m]
7	2171.5	2186.5	[m]
8	2189.5	2216.1	[m]
9	2217.0	2226.7	[m]
10	2227.0	2248.9	[m]
11	2250.1	2266.0	[m]

Total core sample length [m]	189.4
Cores available for sampling?	YES

Core photos



2005-2010m



2010-2015m



2015-2020m



2020-2023m



2023-2028m



2028-2033m



2033-2038m



2038-2042m



2042-2047m



2047-2052m



2052-2057m



2057-2059m



2059-2064m



2064-2069m



2069-2074m



2074-2078m



2078-2083m



2083-2088m



2088-2093m



2093-2096m



2096-2101m



2101-2105m



2171-2176m



2176-2181m



2181-2186m



2186-2186m



2189-2194m



2194-2199m



2199-2204m



2204-2209m



2209-2214m



2214-2216m



2217-2222m



2222-2226m



2227-2232m



2232-2237m



2237-2242m



2242-2247m



2247-2248m



2250-2255m



2255-2260m



2260-2265m



2265-2266m

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
256	NORDLAND GP
742	UTSIRA FM
836	HORDALAND GP
1681	ROGALAND GP
1681	BALDER FM
1742	SELE FM
1774	LISTA FM
1944	SHETLAND GP
1991	CROMER KNOLL GP
2005	VIKING GP
2005	DRAUPNE FM
2025	SOGNEFJORD FM
2098	HEATHER FM
2168	FENSFJORD FM
2218	HEATHER FM
2270	KROSSFJORD FM
2278	HEATHER FM

Geochemical information

Document name	Document format	Document size [MB]
2617_1	pdf	0.32

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





Document name	Document format	Document size [MB]
2617_31_4_10_COMPLETION_REPORT_AND_LOG	pdf	13.38

Logs

Log type	Log top depth [m]	Log bottom depth [m]
DLL MAFL LSS LDL CNL GR SP AMS	1930	2349
DLL MSFL LSS GR SP AMS	996	1986
MDT GR	2025	2275
MDT GR	2038	2039
MRIL GR	2010	2110
MWD - GR RES DIR	256	1990
VSP	700	2340

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	330.0	36	330.0	0.00	LOT
SURF.COND.	13 3/8	997.0	17 1/2	1010.0	0.00	LOT
INTERM.	9 5/8	1981.0	12 1/4	1990.0	0.00	LOT
OPEN HOLE		2350.0	8 1/2	2350.0	0.00	LOT

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
330	1.10			water based	
1488	1.25	27.0		water based	
1659	1.39	25.0		water based	
1831	1.17	15.0		water based	
1990	1.45	30.0		water based	
2055	1.17	13.0		water based	
2350	1.17	15.0		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]
2617 Formation pressure (Formasjonstrykk)	pdf	0.22

