

**General information**

Wellbore name	31/4-3
Type	EXPLORATION
Purpose	WILDCAT
Status	P&A
Factmaps in new window	link to map
Main area	NORTH SEA
Field	BRAGE
Discovery	31/4-3 Brage
Well name	31/4-3
Seismic location	954 231 SP.586
Production licence	055
Drilling operator	Norsk Hydro Produksjon AS
Drill permit	236-L
Drilling facility	TREASURE SEEKER
Drilling days	140
Entered date	24.12.1979
Completed date	11.05.1980
Release date	11.05.1982
Publication date	29.03.2014
Purpose - planned	WILDCAT
Reentry	NO
Content	OIL/GAS
Discovery wellbore	YES
1st level with HC, age	LATE JURASSIC
1st level with HC, formation	INTRA HEATHER FM SS
2nd level with HC, age	MIDDLE JURASSIC
2nd level with HC, formation	INTRA HEATHER FM SS
Kelly bushing elevation [m]	25.0
Water depth [m]	170.0
Total depth (MD) [m RKB]	4981.0
Maximum inclination [°]	4
Bottom hole temperature [°C]	143
Oldest penetrated age	EARLY PERMIAN
Oldest penetrated formation	ROTLIEGEND GP
Geodetic datum	ED50
NS degrees	60° 35' 12.2" N
EW degrees	3° 5' 38.1" E
NS UTM [m]	6716918.02



EW UTM [m]	505145.68
UTM zone	31
NPDID wellbore	402

Wellbore history

**General**

Well 31/4-3 was drilled on the Bjørgvin Arch in the North Sea, east of the Oseberg main field. Near-by well 31/4-2 on the southern part of the Brage Horst had recently found live oil and gas in small quantities in the Brent Group. The primary objectives were sandstones within the Early Jurassic Dunlin and Statfjord Formation. They were thought to be separate reservoirs with different hydrocarbon/water contacts. A secondary objective was to penetrate a deep seismic marker assumed to be a Paleozoic unconformity. Accumulation of hydrocarbons in Early Triassic and pre-Triassic sandstones were considered possible if adequate seal and source rocks were present.

Operations and results

Wildcat well 31/4-3 was spudded with the semi-submersible installation Treasure Seeker on 24 December 1979 and drilled to TD at 4981 m in rocks of Triassic/Permian age. The well was drilled with seawater and hi-vis sweeps down to 906 m, with XP-20/Spersene/Drispac mud from 906 m to TD.

Two separate hydrocarbon-bearing sandstone intervals were encountered in the Late Jurassic Heather Formation. The Oxfordian to Kimmeridgian "Intra Heather Sand I" from 2018 m to 2082 m had gas down to a gas/oil contact at ca 2035 m and oil down-to 2048 m. The section below 2048 had silty to shaley sand with 82% water saturation. The OWC could be somewhere in this section between 2048 and 2054 m. The Callovian "Intra Heather Sand II" (Fensfjord Formation) from 2136 to 2246 m had oil (57.7% average water saturation) down to a possible OWC at 2172. This section was a silty/shaley sand and the net pay was 24 m. Below this the well penetrated 45 m of Middle Jurassic Brent Group sandstones, a 291 m thick Dunlin Group with sandstone in the Cook Formation and the Johansen Formation, and a 177 m thick Statfjord Group consisting of clean sandstone with some shale beds. These sandstones were all found to be water-bearing. Below the Statfjord Group the well penetrated 1571 m of the Triassic Hegre Group, and ended up in rocks of possibly Permian age. These sections were also water-bearing. Apart from shows in the hydrocarbon bearing Intra Heather Formation sandstones only a weak oil show in the Lista Formation at 1890 to 1905 m was recorded.

A total of seven cores were cut in the well, five in the Jurassic sands and two at total depth. RFT fluid samples were taken at 2043.5 m (oil) and at 2165.3 m (minor air/gas and mud filtrate).

The well was permanently abandoned on 11 May 1980 as an oil and gas discovery.

Testing

Two Drill stem tests were performed in the Intra Heather Formation sandstones.

DST 1 tested the interval 2152 to 2167 m. It flowed 170 m³ water and 170 Sm³ oil/day. The GOR was 64 Sm³/Sm³, the oil gravity was 34.7 deg API, and the gas gravity was 0.74 (air = 1).

DST 2 tested the interval 2023 to 2040 m, across the gas/oil contact. It flowed hydrocarbons at a rate of 245 Sm³ /day. The GOR was 641Sm³/Sm³ and the oil gravity was 40 deg API, and the gas gravity was 0.674 (air = 1). These values represent a blend of fluids from the oil leg and the gas cap. Maximum bottom hole temperature was 89.4 deg C.

Cuttings at the Norwegian Offshore Directorate



Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
290.00	4975.00

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	2155.0	2171.0	[m]
2	2171.0	2186.7	[m]
3	2357.0	2365.8	[m]
4	2544.8	2561.5	[m]
5	2704.8	2718.5	[m]
7	4977.8	4981.0	[m]

Total core sample length [m]	74.2
Cores available for sampling?	YES

Core photos



2155-2157m



2157-2160m



2160-2163m



2163-2165m



2165-2168m



2168-2171m



2171-2173m



2173-2179m



2179-2181m



2181-2184m



2184-2186m



2357-2359m



2359-2362m



2362-2365m



2365-2365m



2544-2547m



2547-2550m



2550-2552m



2552-2555m



2555-2558m



2558-2561m



2561-2561m



2704-2707m



2707-2710m



2710-2712m



2712-2715m



2715-2718m



2718-2718m



4979-4981m



4977-4979m

Palynological slides at the Norwegian Offshore Directorate

Sample depth	Depth unit	Sample type	Laboratory
1969.0	[m]	SWC	IKU
1975.0	[m]	SWC	IKU
1991.0	[m]	SWC	IKU
1995.0	[m]	SWC	
2007.0	[m]	SWC	
2011.5	[m]	SWC	IKU
2012.0	[m]	SWC	IKU
2015.0	[m]	SWC	
2015.0	[m]	SWC	IKU
2016.5	[m]	SWC	IKU
2021.0	[m]	SWC	IKU
2023.0	[m]	SWC	IKU
2027.0	[m]	SWC	
2034.0	[m]	SWC	IKU
2046.0	[m]	SWC	IKU



2052.0	[m]	SWC	
2070.0	[m]	SWC	
2074.0	[m]	SWC	IKU
2085.0	[m]	SWC	IKU
2097.0	[m]	SWC	
2100.0	[m]	SWC	IKU
2110.0	[m]	SWC	
2115.0	[m]	SWC	IKU
2120.0	[m]	SWC	
2133.0	[m]	SWC	
2134.0	[m]	SWC	IKU
2139.0	[m]	SWC	IKU
2148.0	[m]	DC	
2155.9	[m]	C	IKU
2161.5	[m]	C	
2162.0	[m]	C	IKU
2165.9	[m]	C	IKU
2166.4	[m]	C	
2170.0	[m]	C	
2171.0	[m]	C	IKU
2172.2	[m]	C	IKU
2176.6	[m]	C	IKU
2176.9	[m]	C	
2178.0	[m]	DC	
2179.5	[m]	C	IKU
2183.2	[m]	C	
2183.8	[m]	C	IKU
2186.0	[m]	C	
2186.0	[m]	C	IKU
2188.0	[m]	C	
2214.0	[m]	SWC	IKU
2218.0	[m]	C	
2222.0	[m]	C	
2225.0	[m]	SWC	IKU
2245.0	[m]	DC	
2250.0	[m]	SWC	IKU
2264.0	[m]	SWC	IKU
2272.0	[m]	SWC	
2285.0	[m]	SWC	IKU
2295.0	[m]	SWC	



2303.0	[m]	SWC	IKU
2304.0	[m]	SWC	IKU
2318.0	[m]	SWC	
2335.0	[m]	C	
2347.0	[m]	SWC	IKU
2353.0	[m]	DC	
2357.0	[m]	C	IKU
2358.9	[m]	C	
2360.0	[m]	C	IKU
2366.0	[m]	C	
2370.0	[m]	DC	
2377.0	[m]	SWC	IKU
2380.0	[m]	DC	
2382.0	[m]	SWC	
2391.0	[m]	SWC	IKU
2412.0	[m]	SWC	IKU
2417.0	[m]	SWC	
2425.0	[m]	SWC	IKU
2443.0	[m]	SWC	
2445.0	[m]	SWC	IKU
2480.0	[m]	SWC	IKU
2483.0	[m]	SWC	
2503.0	[m]	SWC	
2507.0	[m]	SWC	IKU
2517.0	[m]	SWC	
2520.0	[m]	DC	
2532.5	[m]	SWC	IKU
2549.8	[m]	C	IKU
2550.0	[m]	DC	
2552.2	[m]	C	IKU
2553.8	[m]	C	
2557.0	[m]	C	
2557.4	[m]	C	IKU
2558.7	[m]	C	
2561.5	[m]	C	
2580.0	[m]	C	
2585.0	[m]	SWC	IKU
2610.0	[m]	DC	
2625.0	[m]	SWC	IKU
2637.0	[m]	SWC	



2640.0 [m]	DC	
2670.0 [m]	DC	
2680.0 [m]	SWC	IKU
2698.0 [m]	SWC	IKU
2699.0 [m]	SWC	IKU
2700.0 [m]	DC	
2709.0 [m]	C	
2712.3 [m]	C	
2712.5 [m]	SWC	IKU
2718.0 [m]	C	IKU
2730.0 [m]	DC	
2750.0 [m]	SWC	IKU
2760.0 [m]	DC	
2763.0 [m]	SWC	IKU
2790.0 [m]	DC	
2820.0 [m]	DC	
2850.0 [m]	DC	
2850.0 [m]	SWC	
2880.0 [m]	DC	
2910.0 [m]	DC	
2943.0 [m]	DC	
2970.0 [m]	DC	
2985.0 [m]	DC	
3015.0 [m]	SWC	
3236.0 [m]	SWC	IKU
4310.0 [m]	SWC	IKU

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
195	NORDLAND GP
726	UTSIRA FM
906	HORDALAND GP
1723	ROGALAND GP
1723	BALDER FM
1744	SELE FM
1810	LISTA FM
1940	VÅLE FM
1965	SHETLAND GP



2010	VIKING GP
2010	DRAUPNE FM
2018	SOGNEFJORD FM
2082	HEATHER FM
2136	FENSFJORD FM
2327	BRENT GP
2411	DUNLIN GP
2411	DRAKE FM
2448	COOK FM
2470	AMUNDSEN FM
2543	JOHANSEN FM
2702	STATFJORD GP
2879	HEGRE GP
4450	NO FORMAL NAME

Geochemical information

Document name	Document format	Document size [MB]
402_1	pdf	0.55
402_2	pdf	1.56
402_3	pdf	4.94
402_4	pdf	1.07
402_5	pdf	0.40

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

Document name	Document format	Document size [MB]
402_01_WDSS_General_Information	pdf	0.25
402_02_WDSS_completion_log	pdf	0.35

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

Document name	Document format	Document size [MB]
402_31_4_3_COMPLETION_REPORT_AND_LOG	pdf	18.49





Drill stem tests (DST)

Test number	From depth MD [m]	To depth MD [m]	Choke size [mm]
1.0	2127	2143	19.0
2.0	1998	2015	19.0

Test number	Final shut-in pressure [MPa]	Final flow pressure [MPa]	Bottom hole pressure [MPa]	Downhole temperature [°C]
1.0				
2.0				

Test number	Oil [Sm3/day]	Gas [Sm3/day]	Oil density [g/cm3]	Gas grav. rel.air	GOR [m3/m3]
1.0	170	11000	0.851	0.730	64
2.0	245	153000	0.825	0.674	641

Logs

Log type	Log top depth [m]	Log bottom depth [m]
CBL	1800	3692
CPI	1950	2430
CST	1967	2205
CST	1969	3700
CST	1995	2850
CST	2209	2882
CST	3752	4963
CYBERDIP	1924	3713
CYBERDIP	3694	4989
DLL MSFL	1924	2438
FDC CNL	924	2441
FDC CNL	2441	3713
FDC CNL	3692	4982
FDC GR	891	1934
HDT	1924	3713
HDT	3691	4989
ISF SON	195	4980
RFT	1966	3192



RFT	2019	2403
RFT	2043	2043
RFT	2140	2160
RFT	2165	2165
TEMP	225	4981
VELOCITY	500	4975

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	256.0	36	256.0	0.00	LOT
SURF.COND.	20	866.0	26	881.0	1.74	LOT
INTERM.	13 3/8	1899.0	17 1/2	1915.0	1.72	LOT
INTERM.	9 5/8	3669.0	12 1/4	3685.0	1.58	LOT
LINER	7	4981.0	8 3/8	4981.0	0.00	LOT

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
265	1.01			waterbased	
990	1.28	52.0		waterbased	
1361	1.40	71.0		waterbased	
1906	1.40	68.0		waterbased	
2078	1.30	40.0		waterbased	
2588	1.27	44.0		waterbased	
3641	1.21	52.0		waterbased	
4858	1.19	43.0		waterbased	

Thin sections at the Norwegian Offshore Directorate

Depth	Unit
2559.18	[m]
2551.58	[m]
2548.05	[m]

**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]
402 Formation pressure (Formasjonstrykk)	pdf	0.23

