



General information





Wellbore name	31/4-5
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	31/4-5
Seismic location	LINE 954 - 231 SP: 435.
Production licence	055
Drilling operator	Norsk Hydro Produksjon AS
Drill permit	288-L
Drilling facility	NORTRYM
Drilling days	64
Entered date	27.05.1981
Completed date	29.07.1981
Release date	29.07.1983
Publication date	01.04.2014
Purpose - planned	WILDCAT
Reentry	NO
Content	OIL
Discovery wellbore	NO
1st level with HC, age	MIDDLE JURASSIC
1st level with HC, formation	FENSFJORD FM
Kelly bushing elevation [m]	25.0
Water depth [m]	143.0
Total depth (MD) [m RKB]	2930.0
Maximum inclination [°]	2.5
Bottom hole temperature [°C]	82
Oldest penetrated age	TRIASSIC
Oldest penetrated formation	HEGRE GP
Geodetic datum	ED50
NS degrees	60° 33' 30.92" N
EW degrees	3° 3' 25.17" E
NS UTM [m]	6713782.15
EW UTM [m]	503125.28
UTM zone	31
NPDID wellbore	403



Wellbore history

General

Appraisal well 31/4-5 was drilled on the 31/4-3 Discovery on the Bjørgvin Arch in the northern North Sea. The primary objective was to test "Intra Heather Formation" sands on the "B structure" in a crestal position, up dip from the discovery well 31/4-3. The well was planned to delineate known hydrocarbons in the "Intra Heather Sand I" (Sognefjord Formation) and to test the prospect for additional up dip oil and gas reserves in the "Intra Heather Sand II" (Fensfjord Formation). The well was planned to enter the "Intra Heather Sand I" reservoir approximately 20 m below the OWC in order to provide evidence of the extent of the reservoir. The lower oil bearing zone ("Intra Heather Sand II") was prognosed approximately 20 m higher than in well 31/4-3 and significant amounts of up dip oil were thought to exist. The Brent, Dunlin and Statfjord Groups were secondary objectives, possibly prospective in an up dip position.

Operations and results

Wildcat well 31/4-5 was spudded with the semi-submersible installation Nortrym on 27 May 1981 and drilled to TD at 2930 m in the Triassic Hegre Group. The well was drilled without significant problems. It was drilled with seawater and hi-vis pills down to 926 m, with KCl mud from 926 m to 1966 m, and with a lignosulphonate/XC polymer/Drispac mud from 1966 m to TD.

The well penetrated the Sognefjord Formation at 2070 m and the Fensfjord Formation at 2104 m. The Sognefjord Formation was 8.5 m thick and water bearing, but with good oil shows. The Fensfjord Formation was hydrocarbon bearing with a net sand of 60 m and a net pay of 37 m. The oil/water contact was not possible to define exactly, but RFT pressure gradients and shows on cores placed it at ca 2150 m. Shows on sandstones on cores continued down to 2192 The Brent Group was encountered at 2278 m. Sandstones were penetrated in the Brent, Dunlin and Statfjord Groups, but all were water bearing. Weak oil shows were recorded the Dunlin Group and also above the Jurassic, in the Paleocene Maureen Formation at 1992 - 2002 m.

Nine cores were cut. Cores 1 to 8 were cut in succession from 2063 m to 2191 m in the Draupne, Sognefjord, Heather, and Fensfjord formations. Core 9 was cut in the Brent Group from 2292.4 m to 2309.8 m. RFT samples were taken in the Sognefjord Formation at 2072.5 m (formation water, filtrate and trace hydrocarbons) and in the Fensfjord Formation at 2131.5 m (one litre 34.9 deg API oil and 0.4 Sm³ gas).

The well was permanently abandoned on 29 July 1981 as an oil appraisal

Testing

Three DST's were performed in the Fensfjord Formation.

DST 1 tested the interval 2152 - 2158 m. After 10 min initial flow and 80 min shut in the well was opened for the main flow. The well ceased flowing after a few minutes.

DST 2 tested the intervals 2130 - 2133 m and 2134.5-2140 m. It flowed 397 Sm³ oil and 33400 Sm³ gas /day through a 32/64" choke. The GOR was 84 Sm³/Sm³ the oil gravity was 36.2 deg API and the gas gravity was 0.73 (air = 1).

DST 3 (also called DST 3A in well reports) was a combination test over the interval of DST 2 plus the interval 2107-2113 m. It flowed 334 Sm³ oil and 27500 Sm³ gas /day through a 32/64" choke. The GOR was 82 Sm³/Sm³, the oil gravity was 36.2 deg API, and the gas gravity was 0.724 (air = 1).



Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
270.00	2930.00

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	2063.0	2065.0	[m]
2	2065.0	2083.0	[m]
3	2083.0	2100.1	[m]
4	2100.1	2119.0	[m]
5	2119.0	2136.6	[m]
6	2137.5	2155.6	[m]
7	2156.5	2173.8	[m]
8	2173.8	2191.7	[m]
9	2292.4	2309.9	[m]

Total core sample length [m]	144.3
Cores available for sampling?	YES

Core photos



2063-2065m



2065-2068m



2068-2071m



2071-2074m



2074-2077m



2077-2080m



2080-2083m



2083-2086m



2086-2089m



2089-2092m



2092-2095m



2095-2098m



2098-2100m



2100-2103m



2103-2106m



2106-2109m



2109-2112m



2112-2115m



2115-2118m



2118-2119m



2119-2122m



2122-2125m



2125-2128m



2128-2131m



2131-2134m



2134-2136m



2137-2140m



2140-2143m



2143-2146m



2146-2149m



2149-2152m



2152-2155m



2155-2159m



2159-2162m



2162-2165m



2165-2168m



2168-2171m



2171-2173m



2173-2176m



2176-2179m



2179-2182m



2182-2185m



2185-2188m



2188-2191m



2292-2295m



2295-2298m



2298-2301m



2301-2304m



2304-2307m



2307-2309m

Palynological slides at the Norwegian Offshore Directorate

Sample depth	Depth unit	Sample type	Laboratory
1984.0	[m]	SWC	IKU
1992.0	[m]	SWC	IKU
2002.5	[m]	SWC	IKU
2006.0	[m]	SWC	IKU
2010.5	[m]	SWC	IKU
2017.0	[m]	SWC	IKU
2022.5	[m]	SWC	IKU
2030.5	[m]	SWC	IKU
2034.0	[m]	SWC	IKU
2045.0	[m]	SWC	IKU
2051.0	[m]	SWC	IKU
2061.0	[m]	SWC	IKU
2063.5	[m]	C	IKU
2064.0	[m]	C	IKU
2064.5	[m]	C	IKU
2065.1	[m]	C	IKU
2065.6	[m]	C	IKU
2066.0	[m]	C	IKU
2066.6	[m]	C	IKU
2067.0	[m]	C	IKU
2067.5	[m]	C	IKU
2070.0	[m]	C	IKU
2072.0	[m]	C	IKU



2074.0 [m]	C	IKU
2076.0 [m]	C	IKU
2078.0 [m]	C	IKU
2080.0 [m]	C	IKU
2081.9 [m]	C	IKU
2083.0 [m]	C	IKU
2084.8 [m]	C	IKU
2086.9 [m]	C	IKU
2089.2 [m]	C	IKU
2091.1 [m]	C	IKU
2093.0 [m]	C	IKU
2095.1 [m]	C	IKU
2097.0 [m]	C	IKU
2099.1 [m]	C	IKU
2102.1 [m]	C	IKU
2103.1 [m]	C	IKU
2105.0 [m]	C	IKU
2106.9 [m]	C	IKU
2108.2 [m]	C	IKU
2112.9 [m]	C	IKU
2115.0 [m]	C	IKU
2116.0 [m]	C	IKU
2119.0 [m]	C	IKU
2124.0 [m]	C	IKU
2134.0 [m]	C	IKU
2139.0 [m]	C	IKU
2144.0 [m]	C	IKU
2149.0 [m]	C	IKU
2164.7 [m]	C	IKU
2169.0 [m]	C	IKU
2170.8 [m]	C	IKU
2174.2 [m]	C	IKU
2180.8 [m]	C	IKU
2186.0 [m]	C	IKU
2191.5 [m]	C	IKU
2204.0 [m]	SWC	IKU
2215.0 [m]	SWC	IKU
2220.0 [m]	SWC	IKU
2225.0 [m]	SWC	IKU
2240.0 [m]	SWC	IKU



2241.0	[m]	SWC	IKU
2246.0	[m]	SWC	IKU
2255.0	[m]	SWC	IKU
2259.0	[m]	SWC	IKU
2262.5	[m]	SWC	IKU
2272.0	[m]	SWC	IKU
2274.0	[m]	SWC	IKU
2294.0	[m]	C	IKU
2295.0	[m]	C	IKU
2296.0	[m]	C	IKU
2297.0	[m]	C	IKU
2300.0	[m]	C	IKU
2302.0	[m]	C	IKU
2305.9	[m]	C	IKU
2309.9	[m]	C	IKU
2323.0	[m]	SWC	IKU
2339.5	[m]	SWC	IKU
2352.0	[m]	SWC	IKU
2359.0	[m]	SWC	IKU
2388.0	[m]	SWC	IKU
2390.0	[m]	SWC	IKU
2420.0	[m]	SWC	IKU
2432.0	[m]	SWC	IKU
2445.0	[m]	SWC	IKU
2451.5	[m]	SWC	IKU
2468.0	[m]	SWC	IKU
2507.0	[m]	SWC	IKU
2520.0	[m]	SWC	IKU
2536.0	[m]	SWC	IKU
2557.0	[m]	SWC	IKU
2570.0	[m]	SWC	IKU
2575.0	[m]	SWC	IKU
2577.5	[m]	SWC	IKU
2582.0	[m]	SWC	IKU
2677.0	[m]	SWC	IKU
2691.0	[m]	SWC	IKU
2714.0	[m]	SWC	IKU
2792.0	[m]	SWC	IKU
2810.0	[m]	SWC	IKU
2836.0	[m]	SWC	IKU



2858.0	[m]	SWC	IKU
2863.5	[m]	SWC	IKU
2875.0	[m]	SWC	IKU
2887.0	[m]	SWC	IKU
2905.0	[m]	SWC	IKU
2918.0	[m]	SWC	IKU
2929.0	[m]	SWC	IKU

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
168	NORDLAND GP
696	UTSIRA FM
911	HORDALAND GP
1772	ROGALAND GP
1772	BALDER FM
1824	SELE FM
1862	LISTA FM
1980	VÅLE FM
2011	SHETLAND GP
2050	CROMER KNOLL GP
2060	VIKING GP
2060	DRAUPNE FM
2070	SOGNEFJORD FM
2078	HEATHER FM
2104	FENSFJORD FM
2278	BRENT GP
2356	DUNLIN GP
2356	DRAKE FM
2482	COOK FM
2521	AMUNDSEN FM
2645	STATFJORD GP
2849	HEGRE GP

Geochemical information

Document name	Document format	Document size [MB]
403_1	pdf	0.33





403_2	pdf	1.24
403_3	pdf	0.56

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

Document name	Document format	Document size [MB]
403_01_WDSS_General_Information	pdf	0.11
403_02_WDSS_completion_log	pdf	0.26

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

Document name	Document format	Document size [MB]
403_31_4_5_COMPLETION_LOG	pdf	2.43
403_31_4_5_COMPLETION_REPORT	pdf	29.59

Drill stem tests (DST)

Test number	From depth MD [m]	To depth MD [m]	Choke size [mm]
1.0	2152	2158	0.0
2.0	2130	2133	14.3
3.0	2107	2140	14.3

Test number	Final shut-in pressure [MPa]	Final flow pressure [MPa]	Bottom hole pressure [MPa]	Downhole temperature [°C]
1.0				
2.0				
3.0				

Test number	Oil [Sm ³ /day]	Gas [Sm ³ /day]	Oil density [g/cm ³]	Gas grav. rel.air	GOR [m ³ /m ³]
1.0					
2.0	398	33000	0.845	0.730	84
3.0	334	28000	0.844	0.724	82



**Logs**

Log type	Log top depth [m]	Log bottom depth [m]
CBL VDL	1827	2523
CPI	2104	2210
CST	1984	2274
CST	2284	2582
CST	2677	2929
CYBERDIP	1953	2580
DLL MSFL	1950	2250
FDC CNL	2560	2929
FDC GR	911	1935
HDT	1952	2929
HRT	911	1935
ISF SON	911	2928
LDT CNL	1953	2580
MERGE ISF BHC FDC CNL	1953	2584
MERGE ISF BHC FDC CNL	2560	2930
NGT	1953	2581
RFT	2071	2514
RFT	2072	2072
RFT	2131	2131
VELOCITY	720	2929

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	257.5	36	259.0	0.00	LOT
SURF.COND.	20	911.0	26	925.0	1.71	LOT
INTERM.	13 3/8	1953.0	17 1/2	1966.0	1.65	LOT
INTERM.	9 5/8	2570.0	12 1/4	2585.0	1.65	LOT
OPEN HOLE		2930.0	8 1/2	2930.0	0.00	LOT

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
600	1.06	34.0		waterbased	



1000	1.40	57.0		waterbased	
1340	1.41	54.0		waterbased	
1630	1.40	54.0		waterbased	
1990	1.35	47.0		waterbased	
2180	1.24	47.0		waterbased	
2570	1.24	43.0		waterbased	
2890	1.21	50.0		waterbased	

Thin sections at the Norwegian Offshore Directorate

Depth	Unit
2068.00	[m]
2070.00	[m]
2104.00	[m]
2107.00	[m]
2113.00	[m]
2115.00	[m]
2122.00	[m]
2128.00	[m]
2130.00	[m]
2135.00	[m]
2151.00	[m]
2160.00	[m]
2166.00	[m]
2207.00	[m]
2222.00	[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]
403 Formation pressure (Formasjonstrykk)	pdf	0.22

