Generell informasjon

Brønnbane navn	6407/7-4
Type	EXPLORATION
Formål	APPRAISAL
Status	P&A
Faktakart i nytt vindu	lenke til kart
Hovedområde	NORWEGIAN SEA
Felt	NJORD
Funn	6407/7-1 S Njord
Brønn navn	6407/7-4
Seismisk lokalisering	NH 8604- row 859 & column 1055
Utvinningstillatelse	107
Boreoperatør	Norsk Hydro Produksjon AS
Boretillatelse	600-L
Boreinnretning	POLAR PIONEER
Boredager	75
Borestart	13.01.1989
Boreslutt	28.03.1989
Plugget og forlatt dato	31.01.2017
Frigitt dato	28.03.1991
Publiseringsdato	09.03.2009
Opprinnelig formål	APPRAISAL
Gjenåpnet	NO
Innhold	OIL
Funnbrønnbane	NO
1. nivå med hydrokarboner, alder	MIDDLE JURASSIC
1. nivå med hydrokarboner, formasjon.	ILE FM
2. nivå med hydrokarboner, alder	EARLY JURASSIC
2. nivå med hydrokarboner, formasjon	BÅT GP
Avstand, boredekk - midlere havflate [m]	23.0
Vanndybde ved midlere havflate [m]	329.0
Totalt målt dybde (MD) [m RKB]	3211.0
Totalt vertikalt dybde (TVD) [m RKB]	3204.0
Maks inklinasjon [°]	9.7
Temperatur ved bunn av brønnbanen [°C]	122

Eldste penetrerte alder	EARLY JURASSIC
Eldste penetrerte formasjon	ÅRE FM
Geodetisk datum	ED50
NS grader	64° 15' 43.43'' N
ØV grader	7° 13' 25.84'' E
NS UTM [m]	7127595.36
ØV UTM [m]	413943.15
UTM sone	32
NPDID for brønnbanen	1360

Brønnhistorie

General

Well 6407/7-4 was drilled on the Njord A-East structure in the southern part of the Halten Terrace. The Njord structure is located ca 30 km west of the Draugen Field. The location was within a gentle ice berg plough mark with a trend southwest-northeast. The primary objective was to establish the oil-water contact in the Tilje Formation. Secondary objectives were to obtain a better mapping of the reservoir quality of the Tilje Formation on the east flank, to test productivity and injectivity of the Tilje Formation, and to appraise the down flank oil bearing potential and productivity of the Ile Formation. Reservoir fluids including formation water should be sampled. Boulders were expected at 395 m, and shallow gas from 509 - 528 m and especially at 553 m.

Operations and results

Appraisal well 6407/7-4 was spudded by the semi-submersible rig Polar Pioneer on 11 January 1989 drilled to TD at 3211 m in Early Jurassic sediments of the Åre Formation. Spudding was delayed due to severe weather conditions causing the rig to drift 43 nautical miles off location. No shallow gas was encountered. Further periods of bad weather led to some problems and WOW, but apart from this the drilling proceeded without significant problems. The well was drilled with spud mud down to 538 m and with KCl mud from 538 m to TD.

The well proved oil in sands of the Ile, Tilje, and Åre Formations. The Ile Formation had oil from 2873.5 to 2896 m with a net pay of 14.8 m. The Tilje Formation had oil from 2972.5 m and down to 3120 m. Net pay in the Tilje Formation was 89.5 m. From logs, cores, and DST data an OWC could be placed at ca 3120 m in the Tilje Formation, while RFT data indicated a contact at 3110 m. The CPI log also showed a thin oil zone between 3148 and 3153 m in the Åre Formation. Weak shows (minor spotted blue-white to yellow white direct and cut fluorescence) were seen on limestones at 1850 - 1890 m. At 2435 to 2450 m in the Kvitnos Formation sandstones had direct and crush cut yellow-white fluorescence. From 3120 m to 3142 m there were no shows. Below 3142 m only weak shows were observed.

One core was cut from 2877 - 2896 m, and a total of nine cores were cut from 2974 - 3140 m. Twenty-six of 30 sidewall cores were recovered. Segregated RFT samples were taken at 2885 m (water/filtrate with traces of oil and gas), and at 3037 m (0.85 Sm3 gas and 5 litres 42.5 deg API oil in 2 3/4 gallon chamber).

The well was permanently abandoned on 28 March 1989 as an oil appraisal well.

Testing

Three DST tests were performed in this well.

Test no 1 was performed in the interval 3126 - 3138.5 m in the water zone. It produced 147 m3 water and 424 Sm3 gas /day through a 11.11 mm choke. The gas gravity was 0.69 (air = 1) with 11% CO2 and 0.1 ppm H2S. The down-hole temperature in the test, measured at 3065.7 m, was 118.5 deg C.

Test no 2 A was performed in the interval 2999 - 3008 m. It produced 242 Sm3 oil and 46000 Sm3 gas /day through a 7.94 mm choke. The GOR was 185 Sm3/Sm3, oil density was 0.83 g/cm3, gas gravity was 0.74 (air = 1) with 2% CO2 and 2 ppm H2S. The down-hole temperature in the test, measured at 2957.7 m, was 115.7 deg C.

Test no 2 B was performed in the combined intervals 2999 - 3008 m and 3028 - 3071 m. It produced 740 Sm3 oil and 125000 Sm3 gas /day through a 12.7 mm choke. The GOR was169 Sm3/Sm3, oil density was 0.84 g/cm3, gas gravity was 0.72 (air = 1) with 2% CO2 and 2 ppm H2S. The down-hole temperature in the test, measured at 3005.7 m, was 117.1 deg C.

Borekaks i Sokkeldirektoratet

Borekaksprøve, topp dybde [m]	Borekaksprøve, bunn dybde [m]
550.00	3210.00

Borekaks tilgjengelig for prøvetaking?	YES

Borekjerner i Sokkeldirektoratet

Kjerneprøve nummer	Kjerneprøve - topp dybde	Kjerneprøve - bunn dybde	Kjerneprøve dybde - enhet
1	2877.0	2897.0	[m]
2	2974.6	2982.8	[m]
3	2982.8	3010.5	[m]
4	3010.6	3037.3	[m]
5	3037.3	3040.6	[m]
6	3040.6	3068.1	[m]
7	3069.0	3097.3	[m]
8	3087.0	3100.0	[m]
9	3101.1	3127.7	[m]
10	3128.0	3140.0	[m]

Total kjerneprøve lengde [m]	193.2
Kjerner tilgjengelig for prøvetaking?	YES

Kjernebilder


2877-2882m


2882-2887m


2887-2892m


2887-2897m


2892-2895m


2974-2979m


2979-2983m


2983-2988m


2988-2993m


2993-2998m


2998-3003m


3003-3008m


3008-3012m


3012-3017m


3017-3022m


3022-3027m


3027-3032m


3032-3037m


3037-3040m


3040-3045m


3045-3050m


3050-3055m


3055-3060m


3060-3065m


3065-3068m

3068-3073m 3073-3078m 3078-3083m 3083-3088m 3088-3093m





3093-3098m 3098-3103m 3103-3108m 3108-3113m 3113-3118m





3118-3123m 3123-3127m 3128-3133m 3133-3138m 3138-3140m

Palynologiske preparater i Sokkeldirektoratet

Prøve dybde	Dybde enhet	Prøve type	Laboratorie
1690.0	[m]	DC	STRAT
1700.0	[m]	DC	STRAT
1720.0	[m]	DC	STRAT
1730.0	[m]	DC	STRAT
1750.0	[m]	DC	STRAT
1760.0	[m]	DC	STRAT
1780.0	[m]	DC	STRAT
1790.0	[m]	DC	STRAT
1805.0	[m]	DC	STRAT
1820.0	[m]	DC	STRAT
1835.0	[m]	DC	STRAT
1850.0	[m]	DC	STRAT
1865.0	[m]	DC	STRAT
1880.0	[m]	DC	STRAT
1895.0	[m]	DC	STRAT
1910.0	[m]	DC	STRAT
1925.0	[m]	DC	STRAT
1940.0	[m]	DC	STRAT
1955.0	[m]	DC	STRAT
1970.0	[m]	DC	STRAT
1985.0	[m]	DC	STRAT

2000.0	[m]	DC	STRAT
2015.0	[m]	DC	STRAT
2030.0	[m]	DC	STRAT
2045.0	[m]	DC	STRAT
2060.0	[m]	DC	STRAT
2075.0	[m]	DC	STRAT
2090.0	[m]	DC	STRAT
2105.0	[m]	DC	STRAT
2120.0	[m]	DC	STRAT
2135.0	[m]	DC	STRAT
2150.0	[m]	DC	STRAT
2165.0	[m]	DC	STRAT
2180.0	[m]	DC	STRAT
2195.0	[m]	DC	STRAT
2205.0	[m]	DC	STRAT
2220.0	[m]	DC	STRAT
2490.0	[m]	DC	STRAT
2505.0	[m]	DC	STRAT
2520.0	[m]	DC	STRAT
2535.0	[m]	DC	STRAT
2550.0	[m]	DC	STRAT
2565.0	[m]	DC	STRAT
2580.0	[m]	DC	STRAT
2595.0	[m]	DC	STRAT
2610.0	[m]	DC	STRAT
2625.0	[m]	DC	STRAT
2650.0	[m]	DC	STRAT
2660.0	[m]	DC	STRAT
2670.0	[m]	DC	STRAT
2680.0	[m]	DC	STRAT
2690.0	[m]	DC	STRAT
2700.0	[m]	DC	STRAT
2710.0	[m]	DC	STRAT
2720.0	[m]	DC	STRAT
2730.0	[m]	DC	STRAT
2740.0	[m]	DC	STRAT
2750.0	[m]	DC	STRAT
2760.0	[m]	DC	STRAT
2770.0	[m]	DC	STRAT
2780.0	[m]	DC	STRAT

2790.0	[m]	DC	STRAT
2805.0	[m]	SWC	HYDRO
2815.0	[m]	SWC	HYDRO
2827.0	[m]	SWC	HYDRO
2846.0	[m]	SWC	HYDRO
2850.0	[m]	SWC	HYDRO
2855.0	[m]	SWC	HYDRO
2860.0	[m]	SWC	HYDRO
2866.0	[m]	SWC	HYDRO
2872.0	[m]	DC	STRAT
2878.1	[m]	C	HYDRO
2886.4	[m]	C	HYDRO
2891.7	[m]	C	HYDRO
2894.7	[m]	C	HYDRO
2898.5	[m]	SWC	HYDRO
2905.0	[m]	DC	STRAT
2912.0	[m]	SWC	HYDRO
2920.0	[m]	DC	STRAT
2927.0	[m]	SWC	HYDRO
2932.0	[m]	DC	STRAT
2940.0	[m]	SWC	HYDRO
2950.0	[m]	SWC	HYDRO
2950.0	[m]	SWC	HYDRO
2957.0	[m]	DC	STRAT
2965.0	[m]	SWC	HYDRO
2975.2	[m]	C	HYDRO
2979.7	[m]	C	HYDRO
2982.5	[m]	C	HYDRO
2987.5	[m]	C	HYDRO
2996.6	[m]	C	HYDRO
3000.0	[m]	DC	STRAT
3009.5	[m]	C	HYDRO
3020.8	[m]	C	HYDRO
3026.8	[m]	C	HYDRO
3033.3	[m]	C	HYDRO
3038.3	[m]	C	HYDRO
3046.6	[m]	C	HYDRO
3056.9	[m]	C	HYDRO
3059.4	[m]	C	HYDRO
3069.2	[m]	C	HYDRO

3073.5	[m]	C	HYDRO
3078.5	[m]	C	HYDRO
3086.8	[m]	C	HYDRO
3089.5	[m]	C	HYDRO
3096.3	[m]	C	HYDRO
3099.5	[m]	C	HYDRO
3107.7	[m]	C	HYDRO
3118.6	[m]	C	HYDRO
3123.2	[m]	C	HYDRO
3132.5	[m]	C	HYDRO
3137.2	[m]	C	HYDRO
3139.8	[m]	C	HYDRO
3142.5	[m]	C	HYDRO
3152.0	[m]	DC	STRAT
3161.0	[m]	SWC	HYDRO
3170.0	[m]	SWC	HYDRO
3180.0	[m]	DC	STRAT
3187.0	[m]	DC	STRAT
3197.0	[m]	SWC	HYDRO
3210.0	[m]	SWC	HYDRO
3210.0	[m]	DC	STRAT

Oljeprøver i Sokkeldirektoratet

Test type	Flaske nummer	Topp dyp MD [m]	Bunn dyp MD [m]	Væske type	Test tidspunkt	Prøver tilgjengelig
DST	DST2A	2999.00	3008.00		21.03.1989 - 00:00	YES
DST	DST 2B	2999.00	3008.00		25.03.1989 - 00:00	YES

Litostratigrafi

Topp Dyb [mMD RKB]	Litostrat. enhet
352	NORDLAND GP
352	NAUST FM
1094	KAI FM
1150	HORDALAND GP
1150	BRYGGE FM

1735	ROGALAND GP
1735	TARE FM
1794	TANG FM
1990	SHETLAND GP
1990	SPRINGAR FM
1999	NISE FM
2200	KVITNOS FM
2631	CROMER KNOLL GP
2631	LANGE FM
2844	VIKING GP
2844	SPEKK FM
2855	MELKE FM
2860	FANGST GP
2860	NOT FM
2874	ILE FM
2896	BÅT GP
2896	ROR FM
2973	TILJE FM
3139	ÅRE FM

Geokjemisk informasjon

Dokument navn	Dokument format	Dokument størrelse [KB]
1360_1	pdf	0.34
1360_2	pdf	0.19

Dokumenter - eldre Sokkeldirektoratets WDSS rapporter og andre relaterte dokumenter

Dokument navn	Dokument format	Dokument størrelse [KB]
1360_01_WDSS_General_Information	pdf	0.27
1360_02_WDSS_completion_log	pdf	0.16

Dokumenter - rapportert av utvinningstillatelsen (frigitt ihht til regelverk)

Dokument navn	Dokument format	Dokument størrelse [KB]
1360_6407_7_4_COMPLETION_REPORT_AND_LOG	pdf	21.39

Borestrengtester (DST)

Test nummer	Fra dybde MD [m]	Til dybde MD [m]	Reduksjonsventil til størrelse [mm]
1.0	3126	3139	11.1
2.0	2999	3008	7.9
3.0	3028	3071	12.7

Test nummer	Endelig avstengningstrykk [MPa]	Endelig strømningstrykk [MPa]	Bunnhullstrykk [MPa]	Borehullstemperatur [°C]
1.0				119
2.0				115
3.0				117

Test nummer	Olje produksjon [Sm3/dag]	Gass produksjon [Sm3/dag]	Oljetetthet [g/cm3]	Gasstyngde rel. luft	GOR [m3/m3]
1.0		424		0.690	
2.0	242	46000	0.830	0.740	185
3.0	740	125000	0.840	0.720	169

Logger

Type logg	Topp dyp for logg [m]	Bunn dyp for logg [m]
CBL VDL CET GR	2280	3168
CST GR	2805	3210
DIL LSS LDL CNL GR SP AMS	1040	2805
DIL LSS LDL CNL NGS GR SP AMS	2792	3214
DLL MSFL GR	2792	3210
FEWD - GR RES NEU POR DENS	2965	3208
MWD - GR RES DIR	352	2877
MWD - GR RES DIR	2896	2974
RFT HP AMS	2876	3201
RFT HP AMS	3037	3037
SHDT GR	2792	3214
VSP	1200	3160

Foringsrør og formasjonsstyrketester

Type utforing	Utforing diam. [tommer]	Utforing dybde [m]	Brønnbane diam. [tommer]	Brønnbane dyp [m]	LOT/FIT slam eqv. [g/cm3]	Type formasjonstest
CONDUCTOR	30	440.0	36	0.0	0.00	LOT
INTERM.	20	524.0	26	541.0	1.41	LOT
INTERM.	13 3/8	1099.0	18 1/2	1118.0	1.96	LOT
INTERM.	9 5/8	2790.0	12 1/4	2812.0	1.60	LOT
LINER	7	3209.0	8 1/2	3211.0	0.00	LOT

Boreslam

Dybde MD [m]	Egenvekt, slam [g/cm3]	Viskositet, slam [mPa.s]	Flytegrense [Pa]	Type slam	Dato, måling
366	1.05	10.0	35.0	WATER BASED	17.01.1989
390	1.05	10.0	35.0	WATER BASED	17.01.1989
419	1.05	10.0	35.0	WATER BASED	17.01.1989
440	1.05	10.0	35.0	WATER BASED	17.01.1989
500	1.47	19.0	4.0	WATER BASED	28.03.1989
524	1.05	10.0	35.0	WATER BASED	18.01.1989
538	1.20	20.0	8.0	WATER BASED	20.01.1989
538	1.05	10.0	35.0	WATER BASED	19.01.1989
938	1.22	14.0	7.0	WATER BASED	24.01.1989
1115	1.20	10.0	7.0	WATER BASED	24.01.1989
1115	1.23	11.0	7.0	WATER BASED	24.01.1989
1570	1.60	26.0	8.0	WATER BASED	24.01.1989
1959	1.60	19.0	8.0	WATER BASED	25.01.1989
2197	1.60	18.0	5.0	WATER BASED	26.01.1989
2273	1.60	17.0	6.0	WATER BASED	27.01.1989
2293	1.60	25.0	9.0	WATER BASED	30.01.1989
2330	1.60	26.0	7.0	WATER BASED	30.01.1989
2330	1.60	25.0	7.0	WATER BASED	30.01.1989
2330	1.60	25.0	7.0	WATER BASED	31.01.1989
2333	1.60	23.0	6.0	WATER BASED	01.02.1989
2387	1.60	23.0	6.0	WATER BASED	02.02.1989
2399	1.60	23.0	6.0	WATER BASED	03.02.1989
2399	1.60	21.0	5.0	WATER BASED	07.02.1989
2404	1.60	22.0	5.0	WATER BASED	07.02.1989
2404	1.60	22.0	5.0	WATER BASED	08.02.1989

2481	1.60	18.0	6.0	WATER BASED	09.02.1989
2580	1.60	24.0	9.0	WATER BASED	10.02.1989
2645	1.60	20.0	8.0	WATER BASED	13.02.1989
2703	1.60	21.0	10.0	WATER BASED	13.02.1989
2775	1.60	19.0	8.0	WATER BASED	13.02.1989
2808	1.60	19.0	9.0	WATER BASED	16.02.1989
2808	1.47	12.0	5.0	WATER BASED	24.02.1989
2808	1.60	18.0	5.0	WATER BASED	14.02.1989
2808	1.60	19.0	9.0	WATER BASED	15.02.1989
2808	1.60	19.0	9.0	WATER BASED	17.02.1989
2808	1.60	19.0	9.0	WATER BASED	20.02.1989
2808	1.60	19.0	9.0	WATER BASED	21.02.1989
2808	1.60	19.0	9.0	WATER BASED	22.02.1989
2808	1.60	19.0	9.0	WATER BASED	23.02.1989
2877	1.47	26.0	7.0	WATER BASED	27.02.1989
2920	1.47	27.0	6.0	WATER BASED	27.02.1989
2949	1.47	19.0	4.0	WATER BASED	28.03.1989
2974	1.47	29.0	7.0	WATER BASED	27.02.1989
3010	1.47	27.0	7.0	WATER BASED	28.02.1989
3040	1.47	31.0	8.0	WATER BASED	01.03.1989
3068	1.47	28.0	7.0	WATER BASED	02.03.1989
3101	1.47	28.0	7.0	WATER BASED	03.03.1989
3121	1.47	20.0	5.0	WATER BASED	28.03.1989
3121	1.47	21.0	7.0	WATER BASED	20.03.1989
3121	1.47	20.0	5.0	WATER BASED	20.03.1989
3121	1.47	20.0	5.0	WATER BASED	21.03.1989
3121	1.47	19.0	4.0	WATER BASED	28.03.1989
3129	1.47	25.0	7.0	WATER BASED	06.03.1989
3171	1.47	27.0	8.0	WATER BASED	09.03.1989
3171	1.47	19.0	6.0	WATER BASED	10.03.1989
3171	1.47	20.0	6.0	WATER BASED	13.03.1989
3171	1.47	20.0	7.0	WATER BASED	14.03.1989
3171	1.47	20.0	7.0	WATER BASED	16.03.1989
3171	1.47	20.0	7.0	WATER BASED	17.03.1989
3171	1.47	21.0	7.0	WATER BASED	20.03.1989
3171	1.47	21.0	7.0	WATER BASED	13.03.1989
3182	1.47	25.0	7.0	WATER BASED	06.03.1989
3211	1.47	26.0	6.0	WATER BASED	07.03.1989
3211	1.47	26.0	6.0	WATER BASED	06.03.1989
3211	1.47	24.0	5.0	WATER BASED	08.03.1989

Trykkplott

Porertrykksdataene kommer fra logging i brønnen hvis ingen annen kilde er oppgitt. I noen brønner der trykk ikke er logget, er det brukt informasjon fra formasjonstester eller brønnspark. Trykkdataene er rapportert inn til Oljedirektoratet og videre prosessert og kvalitetssikret av IHS Markit.

Dokument navn	Dokument format	Dokument størrelse [KB]
1360_Formation_pressure_(Formasjonstrykk)	pdf	0.29