



Generell informasjon

Brønnbane navn	31/6-1
Type	EXPLORATION
Formål	WILDCAT
Status	P&A
Faktakart i nytt vindu	lenke til kart
Hovedområde	NORTH SEA
Felt	TROLL
Funn	31/6-1 (Troll Øst)
Brønn navn	31/6-1
Seismisk lokalisering	ST 8007 - 123 SP 1175
Utvinningstillatelse	085
Boreoperatør	Norsk Hydro Produksjon AS
Boretillatelse	381-L
Boreinnretning	NORTRYM
Boredager	106
Borestart	15.07.1983
Boreslutt	28.10.1983
Frigitt dato	28.10.1985
Publiseringsdato	15.02.2006
Opprinnelig formål	WILDCAT
Gjenåpnet	NO
Innhold	OIL/GAS
Funnbrønnbane	YES
1. nivå med hydrokarboner, alder	LATE JURASSIC
1. nivå med hydrokarboner, formasjon.	SOGNEFJORD FM
2. nivå med hydrokarboner, alder	MIDDLE JURASSIC
2. nivå med hydrokarboner, formasjon	FENSFJORD FM
Avstand, boredekk - midlere havflate [m]	25.0
Vanndybde ved midlere havflate [m]	302.0
Totalt målt dybde (MD) [m RKB]	4070.0
Totalt vertikalt dybde (TVD) [m RKB]	4070.0
Maks inklinasjon [°]	6.25
Temperatur ved bunn av brønnbanen [°C]	132
Eldste penetrerte alder	PRE-DEVONIAN



Eldste penetrerte formasjon	BASEMENT
Geodetisk datum	ED50
NS grader	60° 38' 44.89" N
ØV grader	3° 40' 52.28" E
NS UTM [m]	6723687.94
ØV UTM [m]	537253.60
UTM sone	31
NPDID for brønnbanen	22

Brønnhistorie

General

The primary objectives of the wildcat 31/6-1 was to test Late and Middle Jurassic sandstones on the main culmination of the Troll east structure in the western part of block 31/6. Secondary objectives were Middle to Early Jurassic and Triassic sandstones and a possible sandstone reservoir of pre-Triassic age within a set of tilted fault blocks buried by Triassic strata. The Troll east structure is a large tilted fault block containing Jurassic and older strata. The closure

at Sognefjord Formation level is delineated by a flatspot covering most of the 31/6 block. The flatspot was expected to be a gas/fluid contact evident on the seismic and penetrated by nine wells in the Troll West area to the NNW in block 31/2. Planned TD of the well was 3800 m into rocks of pre-Triassic (? Devonian age).

Operations and results

Wildcat well 31/6-1 was spudded with the semi-submersible installation Nortrym on 15 July 1983 and drilled to TD at 4070 m in pre-Devonian basement rock. Problems with getting logging tools past the 30" casing shoe occurred due to gumbo problems. Further drilling went forth without major problems. The well was drilled with spud mud down to 425 m, with seawater / prehydrated gel and hi-vis pills from 425 m to 749 m, and with KCl/polymer/PHPA mud from 749 m to TD

The total net sand in the Viking Group (1352-1805 m) found to be 424.25 m giving a net/gross ratio of 0.94 m with an average porosity of 27.5%. The Sognefjord Formation (1352-1488 m), the Heather Formation Unit B, (1488-1517.5 m) and the upper part of the Fensfjord Formation were found gas bearing from 1352 to 1571 m where the gas/oil contact was found. Below this a thin (3 m) oil zone was present with an oil/water contact at approximately 1574 m. The hydrocarbon-bearing reservoir consisted of very fine to fine grained sandstones, occasionally medium to coarse. They were generally friable to loose with a few tight calcite cemented stringers. The gross hydrocarbon column is 222 m and the net pay was calculated to be 198 m with an average porosity of 28.7% and an average water saturation of 19.1%.

Triassic rocks (Hegre Group) were encountered at 2155.5 m. The basal part of the Triassic was characterized by homogenous shales, which were easily distinguished on wire line logs by their high gamma ray (100 - 120 API units). The shales are moderate brown to red brown, micromicaceous, silty and predominantly much more calcareous than the overlying interval. This interval has been dated as Scythian to Anisian down to 3925 m, (?) Scythian to 3978 m and indeterminate down to crystalline basement rocks of indeterminate age at 4013 m. The middle to lower Jurassic and Triassic sandstones were found water bearing.

FMT pressure recordings and sampling were performed over the reservoir interval. A few



pressure readings were also taken in the Cook Formation (Dunlin Group), but these were invalid and were not used for pressure gradient evaluations. The valid data gave a gas gradient of 0.012 bar/m (0.053 psi/ft) with an underlying water gradient of 0.099 bar/m (0.437 psi/ft). The interposed oil gradient is estimated to be 0.086 bar/m (0.38 psi/ft). FMT fluid samples were taken at 1371 m, (gas) 1444.6 m (gas), 1564.0 m (gas), 1564.6 m (gas), 1570.2 m (gas and water/mud filtrate), 1573.6 m (gas, 0.75 l oil, and water/mud filtrate), and 1576.5 m (no gas, 8.9 l water/mud filtrate). A total of 20 cores were cut continuously from the Heather Formation siltstone interval below the Draupne Formation down into the Fensfjord Formation sandstones, across the OWC in core no 17. A total of 235.4 m core was recovered. One 0.3 m core (core no 20) was cut in gneiss at TD. In addition to this, 225 sidewall cores were successfully recovered.

The well was permanently abandoned on as a gas and oil discovery

Testing

Two production tests were successfully performed over two intervals in the gas zone. Both tests were gravel pack completions. DST No 1 (1562.5 - 1567.5 m) in the Fensfjord Formation in the lower part of the gas zone, produced 842000 Sm³/day of 0.635 gravity gas (air =1) through a 22.2 mm choke (56/64"). DST No 2 (1435 - 1441 m) was performed in the lower part of the Sognefjord Formation and flowed 733000 Sm³ /day of gas through a 19 mm (48/64") choke. Gas gravity was 0.650. The pore pressure at the top of the reservoir was measured to be 156.06 bar (2263.5 psi). Maximum temperature recorded during DST1 was 69.4 deg C. Maximum temperature recorded during DST 2 was 64.4 deg C. This correspond to a ca 54 deg C/km linear gradient from the sea floor (assumed at 4 deg C) to top reservoir. This is a very high gradient compared to wells outside of the Troll field.

Borekaks i Sokkeldirektoratet

Borekaksprøve, topp dybde [m]	Borekaksprøve, bunn dybde [m]
430.00	4070.00

Borekaks tilgjengelig for prøvetaking?	NO
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Borekjerne i Sokkeldirektoratet

Kjerneprøve nummer	Kjerneprøve - topp dybde	Kjerneprøve - bunn dybde	Kjerneprøve dybde - enhet
2	1349.0	1350.0	[m]
3	1352.5	1361.0	[m]
4	1361.5	1370.7	[m]
5	1371.0	1383.0	[m]
6	1389.0	1407.3	[m]
7	1407.5	1424.2	[m]
8	1425.5	1440.5	[m]
9	1443.5	1461.5	[m]
10	1461.0	1477.1	[m]



11	1479.5	1497.8	[m]
12	1498.0	1514.6	[m]
13	1515.5	1534.0	[m]
14	1534.0	1542.7	[m]
15	1543.0	1555.8	[m]
16	1561.0	1561.9	[m]
17	1563.0	1581.8	[m]
18	1581.5	1588.5	[m]
19	1588.5	1605.5	[m]
20	4070.0	4070.8	[m]

Total kjerneprøve lengde [m]	234.0
Kjerner tilgjengelig for prøvetaking?	YES

Kjernebilder



1349-1350m



1352-1357m



1357-1361m



1361-1366m



1366-1370m



1371-1376m



1376-1381m



1381-1384m



1389-1394m



1394-1399m



1399-1404m



1404-1407m



1407-1412m



1412-1417m



1417-1422m



1422-1424m



1425-1430m



1430-1435m



1435-1440m



1443-1448m



1448-1453m



1453-1458m



1458-1461m



1461-1466m



1466-1471m



1471-1476m



1476-1477m



1479-1484m



1484-1489m



1489-1494m



1494-1497m



1498-1503m



1503-1508m



1508-1513m



1513-1514m



1515-1520m



1520-1525m



1525-1530m



1530-1534m



1534-1539m



1539-1542m



1543-1548m



1548-1553m



1553-1555m



1561-1562m



1563-1568m



1568-1573m



1573-1578m



1578-1581m



1581-1586m



1586-1588m



1588-1593m



1593-1598m



1598-1603m



1603-4070m

Palynologiske preparater i Sokkeldirektoratet

Prøve dybde	Dybde enhet	Prøve type	Laboratorie
440.0	[m]	DC	RRI
540.0	[m]	DC	RRI
640.0	[m]	DC	RRI
740.0	[m]	DC	RRI
840.0	[m]	DC	RRI
935.0	[m]	DC	RRI
1035.0	[m]	DC	RRI
1135.0	[m]	DC	RRI
1201.0	[m]	SWC	IKU
1210.0	[m]	SWC	IKU
1217.0	[m]	SWC	IKU
1221.0	[m]	SWC	IKU
1225.0	[m]	SWC	IKU
1230.0	[m]	SWC	IKU
1235.0	[m]	DC	RRI
1236.0	[m]	SWC	IKU
1239.0	[m]	SWC	IKU
1242.0	[m]	SWC	IKU
1245.0	[m]	SWC	IKU
1248.0	[m]	SWC	IKU
1251.0	[m]	SWC	IKU
1253.0	[m]	SWC	IKU
1255.0	[m]	SWC	IKU



Faktasider

Brønnbane / Leting

Utskriftstidspunkt: 14.5.2024 - 21:02

1258.0	[m]	SWC	IKU
1262.0	[m]	SWC	IKU
1268.0	[m]	SWC	IKU
1271.0	[m]	SWC	IKU
1274.0	[m]	SWC	IKU
1277.0	[m]	SWC	IKU
1280.0	[m]	SWC	IKU
1283.0	[m]	SWC	IKU
1289.0	[m]	SWC	IKU
1292.0	[m]	SWC	IKU
1295.0	[m]	SWC	IKU
1298.0	[m]	SWC	IKU
1301.0	[m]	SWC	IKU
1304.0	[m]	SWC	IKU
1310.0	[m]	SWC	IKU
1324.0	[m]	SWC	IKU
1329.0	[m]	SWC	IKU
1332.0	[m]	DC	RRI
1335.0	[m]	SWC	IKU
1340.0	[m]	SWC	IKU
1346.0	[m]	SWC	IKU
1350.0	[m]	SWC	IKU
1430.2	[m]	C	RRI
1572.4	[m]	C	RRI
1606.0	[m]	SWC	IKU
1616.0	[m]	SWC	IKU
1625.0	[m]	SWC	IKU
1644.5	[m]	SWC	IKU
1670.0	[m]	DC	RRI
1671.0	[m]	SWC	IKU
1681.0	[m]	SWC	IKU
1690.0	[m]	SWC	IKU
1716.0	[m]	SWC	IKU
1734.0	[m]	SWC	IKU
1787.6	[m]	SWC	IKU
1808.0	[m]	SWC	IKU
1810.0	[m]	DC	RRI
1818.5	[m]	SWC	IKU
1836.0	[m]	SWC	IKU
1850.0	[m]	DC	RRI



1851.0 [m]	SWC	IKU
1863.0 [m]	SWC	IKU
1870.0 [m]	SWC	RRI
1874.0 [m]	SWC	IKU
1880.0 [m]	DC	RRI
1897.0 [m]	SWC	IKU
1900.0 [m]	DC	RRI
1913.0 [m]	SWC	IKU
1920.0 [m]	DC	RRI
1924.0 [m]	SWC	IKU
1930.0 [m]	DC	RRI
1933.0 [m]	SWC	IKU
1940.5 [m]	C	RRI
1944.0 [m]	SWC	IKU
1950.0 [m]	DC	RRI
1956.0 [m]	SWC	IKU
1960.0 [m]	DC	RRI
1960.7 [m]	DC	RRI
1972.0 [m]	SWC	IKU
1980.5 [m]	SWC	IKU
2106.0 [m]	SWC	IKU
2142.0 [m]	SWC	IKU
2170.0 [m]	DC	RRI
3552.0 [m]	DC	OD
3587.0 [m]	DC	OD
3622.0 [m]	DC	OD
3632.0 [m]	DC	OD
4047.0 [m]	DC	OD

Oljeprøver i Sökkeldirektoratet

Test type	Flaske nummer	Topp dyp MD [m]	Bunn dyp MD [m]	Væske type	Test tidspunkt	Prøver tilgjengelig
DST	DST1	1562.50	1567.50	WATER	29.09.1983 - 00:00	YES
DST	DST2	1435.00	1441.00	CONDE NSATE	18.10.1983 - 00:00	YES
DST	DST 2	1441.00	1435.00	CONDE NSATE	18.10.1983 - 00:00	YES



Litostratigrafi

Topp Dyb [mMD RKB]	Litostrat. enhet
327	NORDLAND GP
531	HORDALAND GP
531	NO FORMAL NAME
579	NO FORMAL NAME
972	ROGALAND GP
972	BALDER FM
1084	SELE FM
1194	LISTA FM
1232	SHETLAND GP
1232	HARDRÅDE FM
1236	UNDIFFERENTIATED
1304	CROMER KNOLL GP
1313	VIKING GP
1313	DRAUPNE FM
1335	HEATHER FM
1352	SOGNEFJORD FM
1488	HEATHER FM
1518	FENSFJORD FM
1720	KROSSFJORD FM
1776	HEATHER FM
1805	BRENT GP
1835	DUNLIN GP
1835	DRAKE FM
1962	COOK FM
1981	JOHANSEN FM
2083	AMUNDSEN FM
2111	STATFJORD GP
2156	HEGRE GP
3978	UNDEFINED GP
4014	BASEMENT

Spleisede logger

Dokument navn	Dokument format	Dokument størrelse [KB]
22	pdf	0.63





Geokjemisk informasjon

Dokument navn	Dokument format	Dokument størrelse [KB]
22_1	pdf	0.96
22_2	pdf	0.25
22_3	pdf	6.56

Dokumenter - eldre Sokkeldirektoratets WDSS rapporter og andre relaterte dokumenter

Dokument navn	Dokument format	Dokument størrelse [KB]
22_01_WDSS_General_Information	pdf	0.27
22_02_WDSS_completion_log	pdf	0.39

Dokumenter - rapportert av utvinningstillatelsen (frigitt ihht til regelverk)

Dokument navn	Dokument format	Dokument størrelse [KB]
22_01_31_6_1_Completion_Report_and_Completion_log	pdf	22.24

Borestrengtester (DST)

Test nummer	Fra dybde MD [m]	Til dybde MD [m]	Reduksjonsven til størrelse [mm]
1.0	1562	1568	22.2
2.0	1435	1441	19.0

Test nummer	Endelig avstengningstrykk [MPa]	Endelig strømningstrykk [MPa]	Bunnhullstrykk [MPa]	Borehullstemperatur [°C]
1.0				
2.0				





Test nummer	Olje produksjon [Sm3/dag]	Gass produksjon [Sm3/dag]	Oljetetthet [g/cm3]	Gasstygde rel. luft	GOR [m3/m3]
1.0		842000		0.635	
2.0		733000		0.630	

Logger

Type logg	Topp dyp for logg [m]	Bunn dyp for logg [m]
CBL VOL	800	1310
CDL CNL GR CAL	1950	4067
CDL SPECTRALOG CNL GR CAL	1295	1978
CFL CNL GR CAL	425	1318
CST	785	1312
CST	1313	1887
CST	1606	1730
CST	1729	1980
CST	2067	4018
CST	2142	3823
DIFL LSBHC GR SP	435	4070
DLL MLL	1310	1604
FMT	1338	1594
FMT	1338	1594
FMT	1371	0
FMT	1444	0
FMT	1564	0
FMT	1564	0
FMT	1570	0
FMT	1573	0
FMT	1576	0
HRD	748	4069
PROLOG	1300	1700
PROLOG	1300	1555
VSP	573	4070

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	424.0	36	426.0	0.00	LOT
SURF.COND.	20	748.0	26	765.0	1.46	LOT
INTERM.	13 3/8	1310.0	17 1/2	1325.0	1.68	LOT
INTERM.	9 5/8	1967.0	12 1/4	1980.0	1.51	LOT
OPEN HOLE		4070.0	8 3/8	4070.0	0.00	LOT

Boreslam

Dybde MD [m]	Egenvekt, slam [g/cm3]	Viskositet, slam [mPa.s]	Flytegrense [Pa]	Type slam	Dato, måling
440	1.13	100.0		seawater	
500	1.07	61.0		seawater	
1000	1.19	46.0		seawater	
1200	1.23	45.0		seawater	
1340	1.31	44.0		seawater	
1980	1.10	41.0		seawater	
2400	1.10	42.0		seawater	
3100	1.11	41.0		seawater	
3800	1.11	46.0		seawater	
4070	1.11	42.0		seawater	

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]
22 Formation pressure (Formasjonstrykk)	pdf	0.22

