## Generell informasjon

| | |
|---|---|
| Brønnbane navn | 16/1-11 |
| Type | EXPLORATION |
| Formål | APPRAISAL |
| Status | P&A |
| Pressemelding | lenke til pressemelding |
| Faktakart i nytt vindu | lenke til kart |
| Hovedområde | NORTH SEA |
| Felt | IVAR AASEN |
| Funn | 16/1-9 Ivar Aasen |
| Brønn navn | 16/1-11 |
| Seismisk lokalisering | inline 886 & crossline 1149 |
| Utvinningstillatelse | 001 B |
| Boreoperatør | Det norske oljeselskap ASA |
| Boretillatelse | 1261-L |
| Boreinnretning | SONGA DELTA |
| Boredager | 63 |
| Borestart | 23.02.2010 |
| Boreslutt | 26.04.2010 |
| Frigitt dato | 26.04.2012 |
| Publiseringsdato | 26.04.2012 |
| Opprinnelig formål | APPRAISAL |
| Gjenåpnet | NO |
| Innhold | OIL/GAS |
| Funnbrønnbane | NO |
| 1. nivå med hydrokarboner, alder | MIDDLE JURASSIC |
| 1. nivå med hydrokarboner, formasjon. | SLEIPNER FM |
| 2. nivå med hydrokarboner, alder | LATE TRIASSIC |
| 2. nivå med hydrokarboner, formasjon | SKAGERRAK FM |
| Avstand, boredekk - midlere havflate [m] | 29.0 |
| Vanndybde ved midlere havflate [m] | 112.0 |
| Totalt målt dybde (MD) [m RKB] | 2625.0 |
| Totalt vertikalt dybde (TVD) [m RKB] | 2625.0 |
| Maks inklinasjon [°] | 1.4 |
| Temperatur ved bunn av brønnbanen [°C] | 105 |

| | |
|---|---|
| Eldste penetrerte alder | LATE TRIASSIC |
| Eldste penetrerte formasjon | SKAGERRAK FM |
| Geodetisk datum | ED50 |
| NS grader | 58° 55' 36.15'' N |
| ØV grader | 2° 11' 7.48'' E |
| NS UTM [m] | 6532327.00 |
| ØV UTM [m] | 453098.97 |
| UTM sone | 31 |
| NPDID for brønnbanen | 6157 |

**Brønnhistorie**

**General**

Well 16/1-11 was drilled to appraise the 16/1-9 discovery on the Gudrun Terrace just west of the Utsira High in the North Sea. The discovery well 16/1-9 was completed in April 2008 and revealed oil shows in the Middle Jurassic Vestland Group, but neither coring or logging was completed according to programme due to hole problems. The extent and reservoir quality of the Sleipner Formation in the Vestland Group was a primary objective in the data acquisition programme for 16/1-11 and an extensive wire line logging suite was planned in order to get as much information as possible regarding the oil-water contact, depth conversion, reservoir thickness, facies, fluids, well productivity and possible barriers in the reservoir. The Sleipner Formation reservoir was prognosed to be 75 m thick and coring of the hydrocarbon bearing part of the reservoir was decided prior drilling. Planned TD was TD at 2579 m, approximately 100 metres below prognosed base of the Sleipner Formation.

**Operations and results**

Well 16/1-11 was spudded with the semi-submersible installation Songa Delta on 23 February 2010. The 8 1/2" section in was drilled to TD at 2625 m in the Skagerrak Formation. After logging problems with setting and cementing the 7" liner made it necessary to make a sidetrack, 16/1-11T2, in order to do a drill stem test. The 8 1/2" sidetrack was kicked off from 2193 m and drilled to 2532 m (2523 m TVD). The sidetrack was drilled deviated with up to 20 deg deviation at its TD. The well was drilled with seawater down to 603.5 m, with Aqua-drill mud with 6% glycol from 603.5 to 1770 m, and with Carbo-Sea oil based mud from 1770 m to TD.

Hydrocarbons were proven in the Sleipner and Skagerrak formations. Top Sleipner Formation came in at 2380.5 m. It consisted of 20 m coarse fining upward sandstones and contained gas. Analysis of core and log data showed good reservoir quality with calculated average effective porosity of about 19% and an average gas saturation of 31%. The Net Pay/Gross was nearly 1.0. The Skagerrak Formation came in at 2400.5 m. The core and log analysis proved a much lower reservoir quality than in the Sleipner Formation, mainly due to carbonate cementation. No contacts could be interpreted from the logs but pressure data gave a gas/oil contact at 2377.8 m TVD MSL. The log and pressure evaluation showed oil down to 2438 m (2409 m TVD MSL) and water up to 2445 m (2416 TVD MSL) in the Skagerrak formation. There were no pressure barriers between the Sleipner and Skagerrak formations. The deepest oil staining and fluorescence was recorded at 2502.8 m.

Five 90 ft cores were cut in the interval 2385.5 m to 2522 m with practically 100 % recovery. Fluid samples were taken with the RCI tool. Gas samples were taken at 2396 m and 2406 m while oil samples were taken at 2408.8 m and 2437.8. A water sample was taken at 2454.1 m.

The well was plugged back for a geological sidetrack on 26 April as an oil and gas appraisal well.

**Testing**

One DST was performed in the sidetrack. It was perforated from 2415 - 2425 m, underbalanced with TCP. It flowed 177 Sm3 oil /day through a 28/64" choke. The oil density was 0.835 g/cm3 and GOR was 127 Sm3/Sm. Initial formation pressure was 244.75 bar at reference depth 2377.8 m TVD MSL. Initial formation temperature at this depth (DST temperature) was 98 deg C.

**Borekaks i Sokkeldirektoratet**

| Borekaksprøve, topp dybde [m] | Borekaksprøve, bunn dybde [m] |
|---|---|
| 610.00 | 2625.00 |

| | |
|---|---|
| Borekaks tilgjengelig for prøvetaking? | YES |

**Borekjerner i Sokkeldirektoratet**

| Kjerneprøve nummer | Kjerneprøve - topp dybde | Kjerneprøve - bunn dybde | Kjerneprøve dybde - enhet |
|---|---|---|---|
| 1 | 2385.5 | 2411.9 | [m ] |
| 2 | 2412.5 | 2439.1 | [m ] |
| 3 | 2439.5 | 2466.6 | [m ] |
| 4 | 2466.5 | 2494.4 | [m ] |
| 5 | 2494.1 | 2522.0 | [m ] |

| | |
|---|---|
| Total kjerneprøve lengde [m] | 135.9 |
| Kjerner tilgjengelig for prøvetaking? | YES |

**Oljeprøver i Sokkeldirektoratet**

| Test type | Flaske nummer | Topp dyp MD [m] | Bunn dyp MD [m] | Væske type | Test tidspunkt | Prøver tilgjengelig |
|---|---|---|---|---|---|---|
| DST | | 2445.00 | 2415.00 | OIL | 16.04.2010 - 00:00 | YES |

**Litostratigrafi**

| Topp Dyb [mMD RKB] | Litostrat. enhet |
|---|---|
| 141 | NORDLAND GP |
| 754 | UTSIRA FM |
| 811 | NO FORMAL NAME |
| 825 | HORDALAND GP |
| 825 | SKADE FM |
| 837 | NO FORMAL NAME |
| 939 | SKADE FM |
| 1226 | NO FORMAL NAME |
| 1609 | GRID FM |

| | |
|---|---|
| 1738 | NO FORMAL NAME |
| 1988 | ROGALAND GP |
| 1988 | BALDER FM |
| 2022 | SELE FM |
| 2075 | LISTA FM |
| 2128 | HEIMDAL FM |
| 2171 | LISTA FM |
| 2202 | VÅLE FM |
| 2208 | SHETLAND GP |
| 2208 | EKOFISK FM |
| 2233 | CROMER KNOLL GP |
| 2233 | ÅSGARD FM |
| 2267 | VIKING GP |
| 2267 | DRAUPNE FM |
| 2318 | HEATHER FM |
| 2381 | VESTLAND GP |
| 2381 | SLEIPNER FM |
| 2401 | NO GROUP DEFINED |
| 2401 | SKAGERRAK FM |

## Geokjemisk informasjon

| Dokument navn | Dokument format | Dokument størrelse [KB] |
|---|---|---|
| 6157_01_16_1_11_gch_transfer_1 | txt | 0.00 |
| 6157_02_16_1_11_gch_results_1 | txt | 0.01 |

## Borestrengtester (DST)

| Test nummer | Fra dybde MD [m] | Til dybde MD [m] | Reduksjonsventil størrelse [mm] |
|---|---|---|---|
| 1.0 | 0 | 0 | 24.0 |

| Test nummer | Endelig avstengningstrykk [MPa] | Endelig strømningstrykk [MPa] | Bunnhullstrykk [MPa] | Borehullstemperatur [°C] |
|---|---|---|---|---|
| 1.0 | | | | 98 |

| Test nummer | Olje produksjon [Sm3/dag] | Gass produksjon [Sm3/dag] | Oljetetthet [g/cm3] | Gasstyngde rel. luft | GOR [m3/m3] |
|---|---|---|---|---|---|
| 1.0 | 525 | | | | |

**Logger**

| Type logg | Topp dyp for logg [m] | Bunn dyp for logg [m] |
|---|---|---|
| MARCH JAR TTRM GR RCI SAM | 2396 | 2437 |
| MRCH GYRO | 2173 | 2174 |
| MRCH GYRO | 2202 | 2204 |
| MRCH JAR TTR GR SBT | 2356 | 2625 |
| MRCH JAR TTR MREX ZDL CN | 2325 | 2625 |
| MRCH JAR TTRM DSL ZDL CN | 2356 | 2521 |
| MRCH JAR TTRM GR JRC GUNS | 0 | 0 |
| MRCH JAR TTRM GR JRC GUNS | 0 | 0 |
| MRCH JAR TTRM GR PERF | 2383 | 2489 |
| MRCH JAR TTRM GR SBT | 2218 | 2489 |
| MRCH JAR TTRM GR SBT | 2356 | 2625 |
| MRCH JAR TTRM GR SPOP | 2405 | 2454 |
| MRCH JAR TTRM GR XMAC C-STAR | 1760 | 2610 |
| MRCH JAR TTRM GR ZVSP | 585 | 2615 |
| MWD LWD - BR GR REMP BHPR MECH | 2361 | 2625 |
| MWD LWD - GR REMP BHPR MECH | 196 | 2361 |

**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 | 196.5 | 36 | 165.5 | 0.00 | LOT |
| SURF.COND. | 20 | 600.0 | 26 | 603.0 | 0.00 | LOT |
| INTERM. | 13 3/8 | 1764.5 | 17 1/2 | 1770.0 | 1.78 | LOT |
| INTERM. | 9 5/8 | 2356.0 | 12 1/4 | 2361.0 | 0.00 | LOT |
| LINER | 7 | 2530.0 | 8 1/2 | 2532.0 | 0.00 | LOT |

**Boreslam**

| Dybde MD [m] | Egenvekt, slam [g/cm3] | Viskositet, slam [mPa.s] | Flytegrense [Pa] | Type slam | Dato, måling |
|---|---|---|---|---|---|
| 202 | 1.04 | | | SPUD MUD | |
| 1753 | 1.30 | 33.0 | | CARBO TECH | |
| 1770 | 1.31 | 16.0 | | AQUACOL KCL/POLYMER/GLYCOL | |
| 2150 | 1.24 | 21.0 | | CARBO TECH | |
| 2167 | 1.30 | 29.0 | | CARBO TECH | |
| 2202 | 1.24 | 31.0 | | CARBO TECH | |
| 2361 | 1.30 | 18.0 | | CARBO TECH | |
| 2473 | 1.24 | 26.0 | | CARBO TECH | |
| 2625 | 1.21 | 21.0 | | CARBO TECH | |

**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] |
|---|---|---|
| 6157_Formation_pressure_(Formasjonstrykk) | pdf | 0.23 |