



Generell informasjon

Brønnbane navn	31/5-7
Type	EXPLORATION
Formål	WILDCAT-CCS
Status	PLUGGED
Pressemelding	lenke til pressemelding
Faktakart i nytt vindu	lenke til kart
Hovedområde	NORTH SEA
Brønn navn	31/5-7
Seismisk lokalisering	3D inline 7598 and crossline 22821 (3D Cube CHGG17M01)
Utvinningstillatelse	
Boreoperatør	Equinor Energy AS
Boretillatelse	1799-L
Boreinnretning	WEST HERCULES
Boredager	97
Borestart	02.12.2019
Boreslutt	06.03.2020
Plugget dato	30.09.2022
Frigitt dato	06.03.2020
Publiseringsdato	10.01.2022
Opprinnelig formål	WILDCAT-CCS
Gjenåpnet	NO
Innhold	WATER
Funnbrønnbane	NO
Avstand, boredekk - midlere havflate [m]	31.0
Vanndybde ved midlere havflate [m]	307.0
Totalt målt dybde (MD) [m RKB]	2915.0
Totalt vertikalt dybde (TVD) [m RKB]	2914.9
Maks inklinasjon [°]	1.7
Temperatur ved bunn av brønnbanen [°C]	115
Eldste penetrerte alder	EARLY JURASSIC
Eldste penetrerte formasjon	STATFJORD GP
Geodetisk datum	ED50
NS grader	60° 34' 35.13" N
ØV grader	3° 26' 36.12" E
NS UTM [m]	6715849.31



ØV UTM [m]	524299.59
UTM sone	31
NPDID for brønnbanen	8951

Brønnhistorie

General

Well 31/5-7 was drilled to test the Northern Light Carbon Capture and Storage (CCS) prospect between the Troll and Brage fields on the Horda Platform in the North Sea. The well is the first CCS well on the Norwegian Continental Shelf. The overall objective of the well was to investigate whether reservoir rocks in the Early Jurassic are suitable for storage of carbon dioxide (CO₂). Specific aims were:

- Confirm the ability to inject a minimum of 0.8 Mt/yr CO₂.
- Confirm Johansen and Cook Formations sandstones presence and with a sufficient reservoir quality for large scale injection purpose
- Confirm Drake Formation sealing potential.
- Additional well objectives were to collect data to meet requirements on overburden management and implementation of data into geomechanical models and leakage risk assessment.

Operations and results

Wildcat well 31/5-7 was spudded with the semi-submersible installation West Hercules on 2 December 2019 and drilled to TD at 2915 m in the Early Jurassic (Hettangian age) Statfjord Group. Drilling operations proceeded without significant problems, but during drill stem testing issues with the Electrical Submersible pump (ESP) and further difficulties with landing the DST string caused 19 days of NPT. The well was drilled with seawater and hi-vis pills down to 931 m and with Glydril water-based mud 931 m to TD.

The lower Drake Formation shale thickness is 75 m, and an extended leak-off test (XLOT) confirmed the sealing potential for the future CO₂ injection. The underlying injection and storage units, Johansen, and Cook Formations, consist of high-quality sandstones with a total thickness of 173 m. Formation pressure data acquired on wire line show that the rocks over and under the Drake shale cap rock are not in communication and the pressure gradients indicate water in all Viking and Brent Group sands.

No hydrocarbon indications were seen on the logs and no shows were seen on the cuttings and the gas levels were very low, below 1 % with gas peaks up to 2.3 %, throughout the upper part of the well. The gas levels were very low throughout the 8 1/2" section as well, between 0.2 and 1 %, without any significant gas peaks. No HC odour or stain was observed in the cores, very weak spotted dull yellow residual fluorescence was seen in core chips between 2907 m and 2765 m, most likely mineral fluorescence.

Four cores were cut in the well. Core 1 was cut from 2592 to 2596 m (79.5% recovery) in the Drake Formation cap rock. Core 2 was cut from 2643 to 2697 m (98.9% recovery) in the Cook Formation sandstones. Cores 3 and 4 were cut from 2709 to 2783 m (95.4 and 94.2 % recovery, respectively) in the Johansen Formation sandstones. MDT fluid samples were taken at 2686.3 m in the Cook Formation and at 2743.5 m in the Johansen Formation. Analyses of water samples from both MDT and DST are available on DISKOS.



Due to the planned later drilling of a side-track and further plans for CO2 injection, a template was pre-installed at location. The well was suspended on 6 March 2020 as a dry well.

Testing

One drill stem test was performed from the interval 2697.5 to 2805 m in the Johansen Formation. A clean-up period of 12 hours was performed to clean the well and to find optimum surface setting for the following main flow. Both choke and ESP were increased in steps. The main flow period was 36 hours on a fixed 44/64" choke size. A corrected water flow rate of approximately 1000 m³/day was achieved. The corrected gas flow rate was around 600 m³/day. No barriers were observed during the test and the observation radius is calculated to between 2200 m to 3200 m. The temperature measured at the gauge depth at the end of the main flow has been extrapolated using Olga flow simulation software down to the top of the probably best producing interval assessed on logs. This gives a temperature of 110 °C at 2770 m. An extensive program for sampling of formation water was carried out.

Borekaks i Sokkeldirektoratet

Borekaksprøve, topp dybde [m]	Borekaksprøve, bunn dybde [m]
940.00	2878.00

Borekaks tilgjengelig for prøvetaking?	YES
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Borekjerne i Sokkeldirektoratet

Kjerneprøve nummer	Kjerneprøve - topp dybde	Kjerneprøve - bunn dybde	Kjerneprøve dybde - enhet
2	2643.0	2696.4	[m]
3	2709.0	2744.3	[m]
4	2747.0	2780.9	[m]

Total kjerneprøve lengde [m]	122.6
Kjerner tilgjengelig for prøvetaking?	YES

Litostratigrafi

Topp Dyb [mMD RKB]	Litostrat. enhet
338	NORDLAND GP
338	UNDIFFERENTIATED
772	HORDALAND GP
772	SKADE FM
1144	UNDIFFERENTIATED



1442	ROGALAND GP
1442	BALDER FM
1530	SELE FM
1580	LISTA FM
1698	SHETLAND GP
1698	HARDRÅDE FM
1741	SVARTE FM
1778	CROMER KNOLL GP
1778	UNDIFFERENTIATED
1838	SOLA FM
1861	ÅSGARD FM
1892	VIKING GP
1892	DRAUPNE FM
1946	HEATHER FM
1957	SOGNEFJORD FM
2104	HEATHER FM
2140	FENSFJORD FM
2278	KROSSFJORD FM
2382	HEATHER FM
2424	BRENT GP
2424	TARBERT FM
2435	NESS FM
2487	ETIVE FM
2510	DUNLIN GP
2510	DRAKE FM
2638	COOK FM
2695	BURTON FM
2702	JOHANSEN FM
2818	AMUNDSEN FM
2832	STATFJORD GP

Logger

Type logg	Topp dyp for logg [m]	Bunn dyp for logg [m]
HRLA PEX	1897	2585
MWD - ARC TS	411	931
MWD - ARC TS	931	1906
MWD - GVR ARC TS	2584	2915
MWD - PD ARC TS	931	1906



MWD - PD ECS TS SS	411	944
MWD - PD OB ARC TS	1906	2584
MWD - TELE	338	411
PEX MSIP	931	959
XPT MSIP FMI	925	2585

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	407.0	36	411.0	0.00	
SURF.COND.	20	925.0	26	931.0	1.54	LOT
INTERM.	13 5/8	1897.0	17 1/2	1906.0	1.57	LOT
LINER	9 5/8	2583.0	12 1/4	2584.0	1.54	LOT
OPEN HOLE		2915.0	8 1/2	2915.0	0.00	