



Generell informasjon

Brønnbane navn	1/9-4
Type	EXPLORATION
Formål	WILDCAT
Status	SUSPENDED
Faktakart i nytt vindu	lenke til kart
Hovedområde	NORTH SEA
Felt	TOMMELITEN GAMMA
Funn	1/9-4 Tommeliten Gamma
Brønn navn	1/9-4
Seismisk lokalisering	line 404-410 shot point 100
Utvinningstillatelse	044
Boreoperatør	Den norske stats oljeselskap a.s
Boretillatelse	182-L
Boreinnretning	ROSS RIG (1)
Boredager	153
Borestart	13.08.1977
Boreslutt	12.01.1978
Frigitt dato	12.01.1980
Publiseringsdato	26.05.2009
Opprinnelig formål	WILDCAT
Gjenåpnet	NO
Innhold	GAS/CONDENSATE
Funnbrønnbane	YES
1. nivå med hydrokarboner, alder	PALEOCENE
1. nivå med hydrokarboner, formasjon.	EKOFISK FM
2. nivå med hydrokarboner, alder	LATE CRETACEOUS
2. nivå med hydrokarboner, formasjon	TOR FM
Avstand, boredekk - midlere havflate [m]	25.0
Vanndybde ved midlere havflate [m]	75.0
Totalt målt dybde (MD) [m RKB]	3710.0
Maks inklinasjon [°]	7.5
Temperatur ved bunn av brønnbanen [°C]	150
Eldste penetrerte alder	LATE PERMIAN
Eldste penetrerte formasjon	ZECHSTEIN GP
Geodetisk datum	ED50



NS grader	56° 29' 3.76" N
ØV grader	2° 56' 0.29" E
NS UTM [m]	6260132.83
ØV UTM [m]	495899.06
UTM sone	31
NPDID for brønnbanen	247

Brønnhistorie

General

Well 1/9-4 was drilled on a salt diapir structure in the Central Graben in the neighbourhood of the Norwegian - UK median line. The primary purpose was to test the Ekofisk and Tor formations of Danian and Maastrichtian age. Lower possible porous zones in chalk and Jurassic sands, if present, were secondary objectives.

Operations and results

Wildcat well 1/9-4 was spudded with the semi-submersible installation Ross Rig on 13 August 1977 and drilled to TD at 3710 m in Late Permian Zechstein salt. There were no serious drilling problems down to a depth of 3100 m. At 3100 m the bit-junksub assembly was lost in the hole. The hole was cemented back and sidetracked after the fishing attempts proved unsuccessful. After one unsuccessful sidetrack attempt the hole was sidetracked again from 3041 m and drilled on to core point at 3122 m. When cutting core no 10 the bottom hole assembly got stuck and a long section of the BHA had to be left in the hole. After some unsuccessful attempts on jarring, the hole was cemented and sidetracked again, from 3059 m in the first sidetrack hole. This second sidetracked hole was drilled to a measured depth of 3353 m. At this point 7" liner was run. 6" hole was drilled to a total measured depth of 3710 m with only minor problems and top of the salt was found at 3650 m. The 6" hole was logged and plugged back. It was found necessary to perform a squeeze job around the 7" liner shoe, but when attempting to pull out after this operation, the BHA stuck just above the cementing stinger. Jarring did not free the pipe, and a cement plug was set above the fish. The well was drilled with high viscosity spud mud of pre-hydrated bentonite, lime, and caustic soda down to 437 m and with Drispac/lime mud from 437 m to 2580 m. From 2580 m the lime was phased out and the remaining well to TD was drilled with a lignite/lignosulphonate gel mud. During abandonment an anchor chain broke in severe weather. The well was plugged back while a supply boat pulled on the anchor chain. A cap was installed on the well head and the well was suspended.

No significant reservoir rock was penetrated above Danian level. The Early Cretaceous Valhall Formation was found resting directly on the salt. No Jurassic sediments were penetrated by the well. Hydrocarbons were encountered and tested in the Ekofisk and Tor Formations from 3114 m down to top Hod Formation at 3312 m. Above the reservoir shows in the form of cut and fluorescence was recorded on occasional shale/limestone/silty cuttings was seen from 1990 to 2733 m. More continuous shows were seen on limestone/shale cuttings in the interval 2808 to 2991 m in the Lower Hordaland Group, through the Balder Formation and into the Sele Formation.

Nine cores were cut from - 3123 m to - 3273 m with close to 100% recovery. No RFT surveys were run and no wire line fluid samples were taken.

The well was suspended on 12 January 1978 as a dry well.

Testing



Four drill stem tests to evaluate productivity and fluid composition were carried out. Hydrocarbons were produced during all the tests. Weather conditions and operational problems interfered with the designed test program.

DST 1 tested the Tor Formation in from interval 3292 to 3296 m. The second flow produced 30582 Sm³ of gas and in the range of 16 Sm³ oil /day. There was no water production. The oil produced had a gravity of 46 deg API and the gas gravity (air = 1) was 0.68. GOR varied in the range 890 to 14000 Sm³/Sm³. Maximum recorded down hole temperature was 136 deg C but the temperature readings were not stable.

DST 2 tested the Tor Formation from the interval 3235 to 3255 m. After acid stimulation the well flowed 673940 Sm³ of gas and 592 Sm³ oil /day on a 48/64" choke. The oil gravity was 48-49 deg API at separator conditions and the gas gravity (air = 1) was 0.67 with 2 - 3 % CO₂. The GOR was in the range 890 to 1160 Sm³/Sm³. No representative temperature reading is available from this test.

DST 3 tested the Ekofisk Formation from the interval 3176 to 3198 m. After acid stimulation the well flowed 32000 Sm³ of gas and 17 Sm³ oil /day with a bottom hole flowing pressure 750 psig at depth 3154 m. This test also produced some emulsion and water. The gas and oil gravities were 0.81 (air = 1) and 45 deg API at separator conditions, respectively. 3% CO₂ was measured in the gas. The GOR varied in the range 1070 to 2140 Sm³/Sm³. Due probably to gas expansion and cooling in the borehole it is assumed that the maximum recorded temperature of 122.2 deg C was not representative for the formation.

DST 4 tested the Ekofisk Formation in the intervals 3127 to 3137 and 3120 to 3123 m. After acid treatment the well flowed 498380 Sm³ of gas and 223 Sm³ oil /day on a 48/64" choke. The gas and oil gravities were 0.688 (air = 1) and 50 - 51 deg API at separator conditions, respectively. 2-3% CO₂ was measured in the gas. The GOR varied in the range 960 - 2850 Sm³/Sm³. The maximum temperature recorded, and the one assumed to be the most representative for the Formation in all four tests, was 134.2 deg C.

Borekaks i Sokkeldirektoratet

Borekaksprøve, topp dybde [m]	Borekaksprøve, bunn dybde [m]
153.00	3710.00

Borekaks tilgjengelig for prøvetaking?	YES
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Borekjerter i Sokkeldirektoratet

Kjerneprøve nummer	Kjerneprøve - topp dybde	Kjerneprøve - bunn dybde	Kjerneprøve dybde - enhet
1	3122.8	3141.2	[m]
2	3141.2	3159.5	[m]
3	3159.5	3173.5	[m]
4	3173.5	3191.8	[m]
5	3191.8	3210.1	[m]
6	3210.1	3218.6	[m]



7	3219.9	3238.0	[m]
8	3238.2	3256.5	[m]
9	3256.5	3273.8	[m]

Total kjerneprøve lengde [m]	149.6
Kjerner tilgjengelig for prøvetaking?	YES

Kjernebilder



3122-3125m



3125-3128m



3128-3130m



3130-3133m



3133-3136m



3136-3138m



3138-3141m



3141-3143m



3143-3146m



3146-3149m



3149-3152m



3152-3154m



3154-3157m



3157-3159m



3159-3162m



3162-3164m



3164-3167m



3167-3170m



3170-3173m



3173-3173m



3173-3176m



3176-3178m



3178-3181m



3181-3184m



3184-3187m



3187-3189m



3189-3191m



3191-3195m



3194-3197m



3197-3199m



3199-3202m



3202-3205m



3205-3208m



3208-3210m



3210-3212m



3212-3215m



3215-3218m



3218-3218m



3219-3222m



3222-3225m



3225-3228m



3222-3225m



3225-3228m



3228-3230m



3230-3233m



3233-3236m



3236-3238m



3238-3240m



3240-3243m



3243-3246m



3246-3249m



3249-3251m



3251-3254m



3254-3256m



3256-3259m



3259-3261m



3261-3264m



3264-3267m



3267-3270m



3270-3272m



3272-3273m

Oljeprøver i Sokkeldirektoratet

Test type	Flaske nummer	Topp dyp MD [m]	Bunn dyp MD [m]	Væske type	Test tidspunkt	Prøver tilgjengelig
DST	TEST1	3292.00	3296.00		01.12.1977 - 00:00	YES
DST	TEST2	3235.00	3255.00		15.12.1977 - 03:00	YES
DST	TEST3	3176.00	3198.00		24.12.1977 - 19:00	YES
DST	TEST4	3137.00	3127.00		29.12.1977 - 00:00	YES

Litostratigrafi

Topp Dyb [mMD RKB]	Litostrat. enhet
100	NORDLAND GP
1025	HORDALAND GP



2941	ROGALAND GP
2941	BALDER FM
2960	SELE FM
3021	LISTA FM
3091	VÅLE FM
3114	SHETLAND GP
3114	EKOFISK FM
3212	TOR FM
3312	HOD FM
3450	BLODØKS FM
3494	HIDRA FM
3646	CROMER KNOLL GP
3646	RØDBY FM
3665	ÅSGARD FM
3690	ZECHSTEIN GP

Geokjemisk informasjon

Dokument navn	Dokument format	Dokument størrelse [KB]
247 1	pdf	2.18
247 2	pdf	3.15
247 3	pdf	0.52

Dokumenter - eldre Sokkeldirektoratets WDSS rapporter og andre relaterte dokumenter

Dokument navn	Dokument format	Dokument størrelse [KB]
247 01 WDSS General Information	pdf	0.21
247 03 WDSS lithlog	pdf	0.06

Dokumenter - rapportert av utvinningstillatelsen (frigitt ihht til regelverk)

Dokument navn	Dokument format	Dokument størrelse [KB]
247 00 1 9 4 Completion Log	pdf	2.48
247 00 1 9 4 Completion Report	pdf	34.55

Borestrengtester (DST)





Test nummer	Fra dybde MD [m]	Til dybde MD [m]	Reduksjonsven til størrelse [mm]
1.0	3292	3296	19.0
2.0	3235	3255	19.0
3.0	3176	3198	19.0
4.0	3137	3127	19.0

Test nummer	Endelig avstengningstrykk [MPa]	Endelig strømningstrykk [MPa]	Bunnhullstrykk [MPa]	Borehullstemperatur [°C]
1.0				
2.0				
3.0				
4.0				

Test nummer	Olje produksjon [Sm3/dag]	Gass produksjon [Sm3/dag]	Oljetetthet [g/cm3]	Gasstyingde rel. luft	GOR [m3/m3]
1.0	16	30582	0.790		
2.0	592	673944	0.790		
3.0		311487			
4.0	223	498379	0.770	0.690	

Logger

Type logg	Topp dyp for logg [m]	Bunn dyp for logg [m]
CBL VDL GR	282	1375
CBL VDL GR	1334	2553
CBL VDL GR	2445	3345
CBL VDL GR	3050	3300
CBL VDL GR	3075	3338
DIL	3065	3348
DLL MSFL CAL SP GR	3000	3347
FDC CNL CAL GR	427	3707
HDT	2875	3349
HDT	3345	3640
IES SP	2090	3347
ISF SONIC	427	3705
SONIC	151	435



VELOCITY	535	3684
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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	151.0	36	151.0	0.00	LOT
SURF.COND.	20	428.0	26	437.0	0.00	LOT
INTERM.	13 3/8	1376.0	17 1/2	1391.0	0.00	LOT
INTERM.	9 5/8	2569.0	12 1/4	2580.0	0.00	LOT
LINER	7	3352.0	8 1/2	3362.0	0.00	LOT
OPEN HOLE		3710.0	6	3710.0	0.00	LOT

Boreslam

Dybde MD [m]	Egenvekt, slam [g/cm3]	Viskositet, slam [mPa.s]	flytegrense [Pa]	Type slam	Dato, måling
151	1.02			WATERBASED	
954	1.17			WATERBASED	
1394	1.70			WATERBASED	
2580	1.89			WATERBASED	
3100	1.75			WATERBASED	
3210	1.75			WATERBASED	
3555	1.70			WATERBASED	
3710	1.72			WATERBASED	