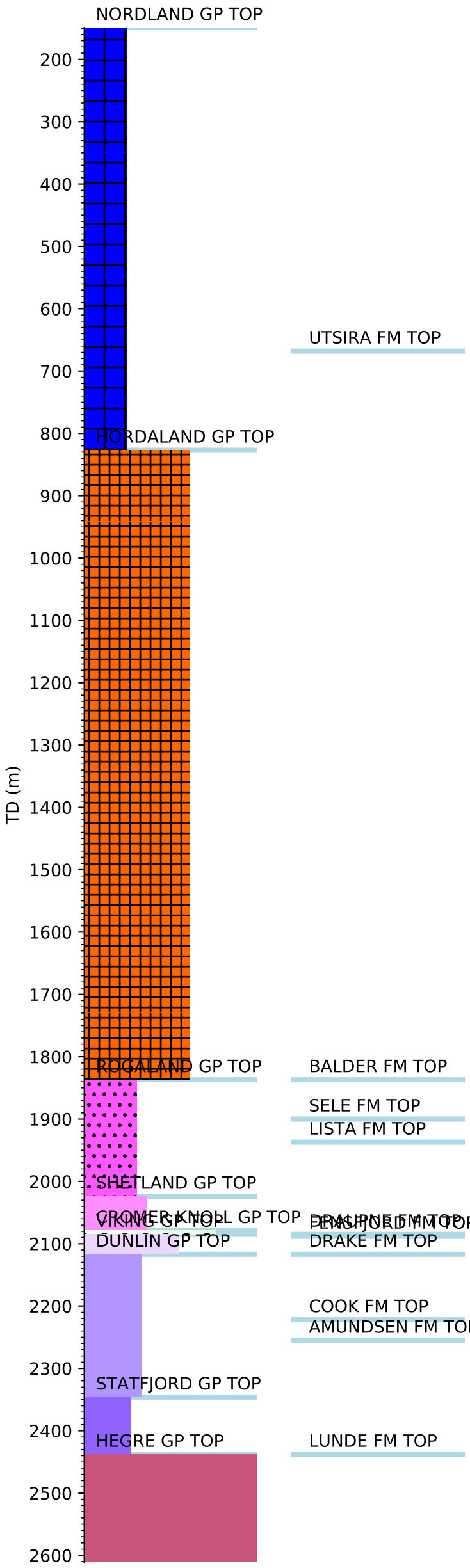
Groups

Formation Tops



Wellbore History

GENERAL

Well 31/4-8 was drilled on the Brage field in the North Sea to appraise the Statfjord Group oil discovery made in well 31/4-7. The Cook Formation of the Dunlin Group was the secondary target. This sandstone was found water bearing in well 31/4-7. Chances for finding hydrocarbons in well 31/4-9 were good since the formation would be penetrated in a structurally higher position. Prognosed TD was 2565 m or 50 m into Triassic rocks.

OPERATIONS AND RESULTS

Appraisal well 31/4-8 was spudded with the semi-submersible installation Treasure Hunter on 11 May 1986 and drilled to TD at 2611 m in the Late Triassic Lunde Formation. The 13 3/8" casing got stuck at 1855 m. Diesel and spot fluid was pumped down the hole and the casing was worked free. The well was drilled with spud mud down to 900 m and with KCl/polymer mud from 900 m to TD. From 2030 m to ca 2400 m the KCl/polymer mud contained 1% diesel as a result of the problem with the stuck casing.

The well 31/4-8 encountered hydrocarbon bearing sandstones and siltstones in the Viking Group, the Statfjord Group and the Lunde Formation. Of these, only the Statfjord reservoir is produceable. The Viking Group consisted of a thin Draupne Formation from 2085 m to 2088 m and a 29 m thick Fensfjord Formation with poorly developed, generally very fine-fine sandstones grading into and interbedded with siltstones and claystones. Some residual hydrocarbons were encountered in the best sands. Net pay in the Fensfjord Formation was 0.61 m, water saturation was 59.9% and the average porosity was 25.5%. The Cook Formation was found water bearing without traces of shows. Average porosity in the Cook sand was 17.7%. The Statfjord Group had a gross oil column of 60 m from 2346 to the OWC at 2406 m. This is practically the same as the OWC found in 31/4-7. The sandstones in the formation consisted of interbedded claystones/siltstones and very fine to very coarse quartz sands with an average porosity of 23.8%. The average porosity above OWC was 23.4%. The average permeability in the Statfjord formation was 1630 mD. The average water saturation of the oil zone in the Statfjord Group sands is 28.9%. The Lunde Formation consisted predominantly of claystones with occasional fine to coarse sandstone beds and limestone stringers. Traces of residual hydrocarbons were found locally in the Lunde sands. A net pay of 1.1 m was calculated, with average porosity of 20.7% and water saturation of 57.3% in the net pay zones. No oil shows were recorded above top Viking Group.

Six cores were cut in the interval 2347 - 2451 m in the Dunlin and Statfjord groups, with recovery between 74 % and 100 %. A wire line SFT segregated sample at 2350.1 m recovered gas and oil.

The well was permanently abandoned on 11 May 1986 as an oil and gas appraisal well.

TESTING

Two DST tests were performed in this well:

DST 1 tested the interval 2349.1 - 2397.6 m through a 1/2 inch choke. It flowed 502.7 Sm3 oil and 19900 Sm3 gas /day. The GOR was 40 Sm3/Sm3, the oil density was 0.83 g/cm3, and the gas gravity 0.82 (air = 1) with 2 % CO2 and no H2S.The test temperature was 95°C.

DST 2 tested water from the interval 2421.7 - 2437.4 m through a 2 inch choke. The water flow rate was 1024 Sm3/day.

The test temperature was 98°C.

LITHOSTRATIGRAPHY & HISTORY FOR WELL: 31/4-8