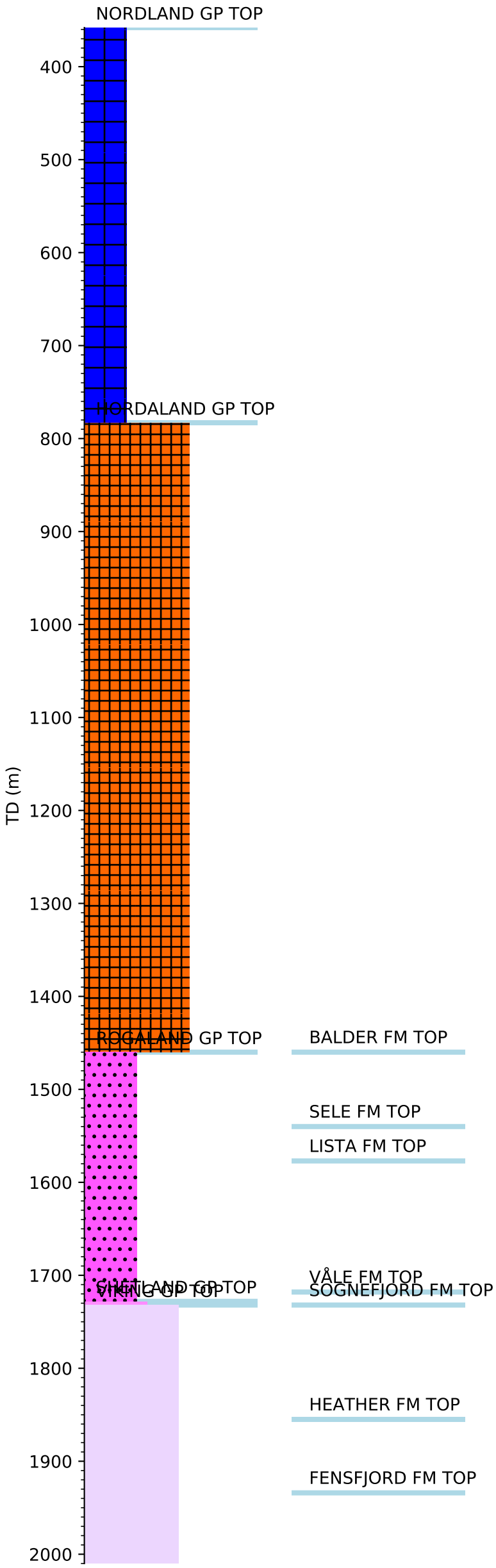
Groups

Formation Tops



Wellbore History

GENERAL

Well 31/2-13 S was drilled as an appraisal in the Troll West oil province in the Northern North Sea. The main objectives of were to investigate the reservoir properties and accumulation conditions between the wells 31/2-5 and 31/2-11. Water and/or gas -coning tests were to be conducted.

OPERATIONS AND RESULTS

Appraisal well 31/2-13 S was spudded with the semi-submersible installation Borgny Dolphin on 2 January 1984 and drilled to TD at 2010 m in the Middle Jurassic Fensfjord Formation. Due to bad weather the string parted and was observed lying across the temporary guide base when the well was spudded. The fish was recovered. Straight hole was drilled down to 500 m where the hole was kicked off with an angle of 1 1/2 degree. Some problems due to tight hole occurred in the 17 1/2" hole. Mud losses to the formation occurred at 1531 and 1700 m, 100 bbls at each depth. A drill break occurred at 1744 m in the 12 1/4" hole section. The well was drilled with seawater and viscous pills down to 473 m, with Gelled mud from 473 m from 473 m to 750 m, with seawater from 750 m to 825 m, and with oil based mud from 825 m to TD. The Oil based mud used was termed "Fazekleen, low toxicity invert oil emulsion mud, based on Shell Sol D70 oil"

Top reservoir (top Sognefjord Formation) was penetrated at 1732 m (1526.5 m TVD), top Heather Formation at 1855 m (1613 m TVD), and top Fensford Formation sandstone at 1934 m (1671 m TVD). Oil and gas were encountered in the Sognefjord Formation. The GOC was at 1790 m (1567 m TVD) and the FWL was estimated at 1828.5 m (1594 m TVD). Strong to moderate fluorescence was observed on the cores down to 1844 m (1606 m TVD), but heavy contamination from the oil-based mud made shows detection somewhat uncertain. The upper half of the oil bearing formation consisted of generally clean sandstones. Below 1555 m TVD the sands were micaceous. Tight calcareous streaks occurred over the whole section. The core permeability in the clean sands ranged from 4 D to 15 D. In the micaceous sands the permeability were from 10 mD to 100 mD.

Eight fibreglass sleeve cores were cut from 1744 to 1844 m in the Sognefjord Formation sands. Seventy metres (70%) were recovered. An RFT segregated fluid sample was taken in the oil zone at 1800 m.

The well was permanently abandoned on 15 March 1984 as a gas and oil appraisal well.

TESTING

A Production test was performed through a 5" production tubing in the Late Jurassic sequence. During clean-up producing 810 Sm3 oil/day gas cap gas broke through. The well was then produced at rates up to 604 Sm3/day. The gas-oil ratio increased from solution GOR (57 Sm3/Sm3) to 552 Sm3/Sm3. The produced oil had a gravity 0.88 - 0.89 G7cm3 (28 deg API), the gas 0.70-0.63 (air = 1). No formation water produced. The estimated critical rate (to gas coning) in 31/2-13, ca 315 Sm3/day, was significantly lower than in 31/2-5 (795 Sm3/day). Maximum down-hole temperature recorded in the production test was 65.2 deg C.

LITHOSTRATIGRAPHY & HISTORY FOR WELL: 31/2-13 S