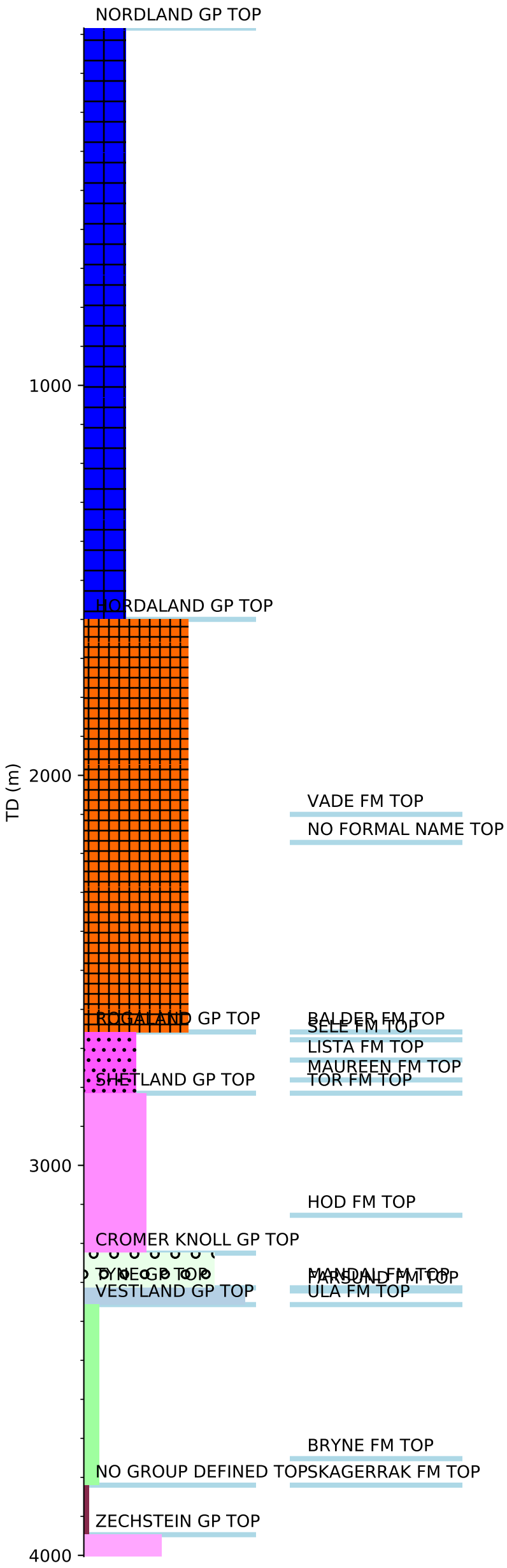
Groups

Formation Tops



Wellbore History

GENERAL

Well 2/2-1 was a wildcat drilled on a salt-induced dome structure in the SE corner of block 2/2. The main target was Late Jurassic sandstone. Secondary targets were pre-Cretaceous sandstones, the Late Cretaceous Chalk and a sandstone of Oligocene age. According to the license agreement, the well should be drilled into the Triassic, salt or a maximum depth of 5000m whatever came first.

The well is Type Well for the Vade Formation.

OPERATIONS AND RESULTS

Exploration well 2/2-1 was spudded with the semi-submersible installation Dyvi Alpha on 9 April 1982 and drilled to TD at 4003 m in the Late Permian Zechstein Group. When drilling the 36" section pipe stuck at 167 m due to a rotary table failure. The well had to be re-spudded on 11 April. Forty barrels of mud was lost to the formation when drilling the 17 1/2" pilot hole in the 26" section. The well was then drilled to TD without serious problems apart from various tight spots. The re-spudded well bore was drilled with sea water and gel down to 207 m, with gel/gypsum mud from 207 m to 665 m, with polymer/gypsum mud from 665 m to 1448 m, added "Super Shale Trol" shale stabilizer at 1448 m, and drilled with lignosulphonate mud from 3260 m to TD.

The well penetrated porous layers in the Oligocene, the Cretaceous and the Upper Jurassic. A full suit of logs was run in these intervals. In the interval 2100 m to 2171 m of the Oligocene, a sand (Vade Formation) with good reservoir rock quality was found. The net - gross ratio reaches 0.95 and the porosity nearly 30%. The RFT measurements indicated permeability in the order of 100 mD. The sand was generally clean, but became shaly just towards the top. The uppermost part of the sand was gas bearing with a net pay thickness of 8 m and a water saturation of 35%. The GWC was picked at 2111 m from the logs and confirmed by RFT measurements. The reservoir pressure is approximately 230 bar (3336 psi) at 2150 m. The Cretaceous chalks were water bearing in this well. Over the interval 2815 m to 3225 m (Tor and Hod Formations) a net porous thickness of 170 m was counted with an average porosity of 22 %. The chalks were clean, but large washouts indicated poor consolidation. Two separate sand layers were penetrated in the Late Jurassic Ula Formation. The uppermost sand from 3352 to 3686 m was water bearing. A net sand thickness of 175 m and an average porosity of 16% were estimated from the logs. This sand is partly shaly. The lower Late Jurassic sand layer was oil bearing over its total thickness. For the interval 3713 m to 3732 m a net pay thickness of 14 m, a porosity of 19% and a water saturation of 30% was found. This sand is rather clean, but fine-grained. It contains a system of healed fractures, which reduces the full-scale reservoir permeability. In the Upper Jurassic four cores were cut. The core permeabilities averaged 40 mD. The permeabilities measured by the RFT tool average 6 mD only. A gas sample was taken at 2109 m in the Oligocene sand using the RFT tool. It contained a light gas with a gravity of 0.57 (air = l) and a methane content of 97%.

TESTING

A DST was performed in the interval 3715.5 m to 3730.0 m of the oil bearing Upper Jurassic sand. The well flowed at a rate of 200 m3/d (1250 bbl/d) with a wellhead pressure of 28 bar (400 psi). No sand or water was produced after the clean up. A permeability of 4 mD and a negative skin was estimated from the Horner plot. The oil had a GOR of approx. 70 sm3/sm3 (400 scf/stb) and a gravity of 0.82 g/cc. The reservoir pressure is 514 bar (7454 psi) and the temperature 136 deg C at 3726 m.

LITHOSTRATIGRAPHY & HISTORY FOR WELL: 2/2-1