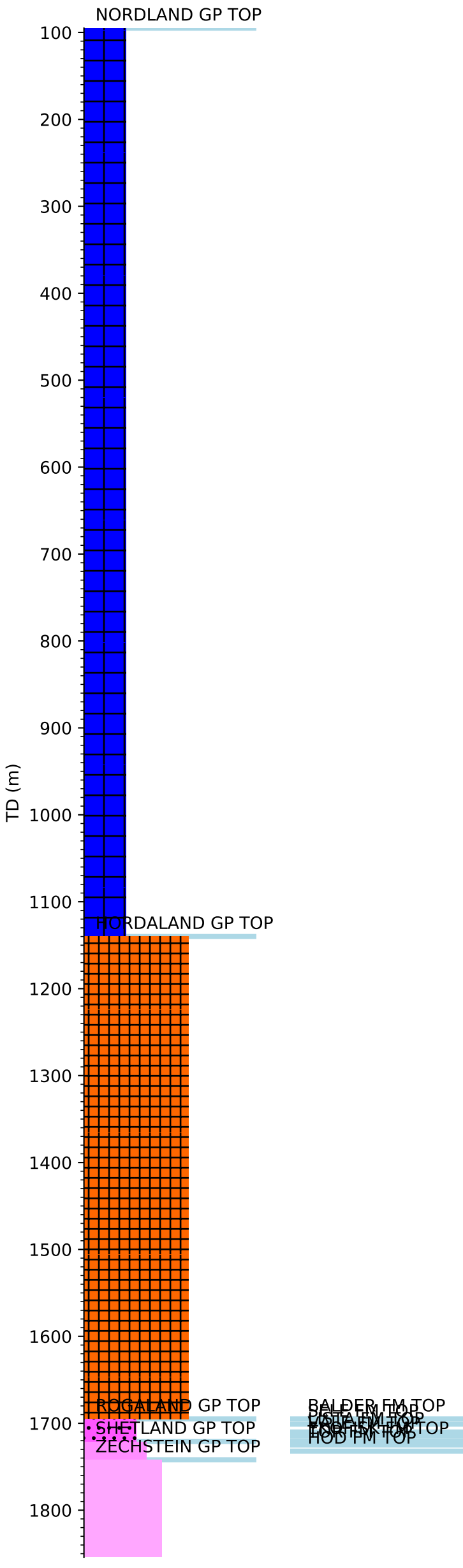
Groups

Formation Tops



Wellbore History

GENERAL

Well 1/6-5 is located in the Feda Graben between the Flyndre and Tommeliten Gamma discovery in the North Sea. The well was drilled on the crest of a major salt diapir. The objective of the well was to test the existence of a chalk raft and the presence of reservoired hydrocarbons.

OPERATIONS AND RESULTS

Wildcat well 1/6-5 was spudded with the semi-submersible installation Dyvi Stena on 20 July 1990 and drilled to TD at 1854 in Late Permian salt of the Zechstein Group. An 8 1/2" pilot hole was drilled from 156m to 600m. The hole was control drilled at 30m/hr maximum ROP as a precaution for encountering shallow gas. No shallow gas was encountered. Pore pressure prediction while drilling in the 1/6-5 well was difficult as the only pore pressure detection parameters that appeared to work were gas measurements, resistivity and sonic log measurements. Other parameters such as shale cuttings density, Electric log density, D-exponent and rate of penetration were not successful in determining high pore pressure zones. However, despite the abnormally high pressures and temperatures encountered drilling went forth without major incidents. A minor salt water flow accompanied by a 37.1 % gas peak occurred during a trip at core point at 1725 m. The mud weight was increased from 15 ppg to 15.3 ppg and finally 15.5 ppg as a result of this flow. In the following coring 119 bbls of mud was lost to the formation, but this was cured by setting an LCM pill. The well was drilled with seawater and viscous pre-hydrated bentonite sweeps down to 600 m and with fresh water polymer mud/Duponol WBS 200 wellbore stabilizer from 600 m to TD.

From 864 m gas readings showed all components from C1 to C4. Gas peaks from the formation were experienced all the way down to the Ekofisk Formation, some of which originated from thin sandstone beds. Oil shows were first observed at 1434 and 1585 m, both in thin limestone beds of Oligocene age. On reaching the top Ekofisk Formation at 1721 m, limestone with oil stain and bright yellow fluorescence was observed.

Two cores were cut. Core 1 was cut from 1725 to 1742.5 m in the Tor and Hod Formations. Only 22% was recovered and most of it was rubble, indicating a highly fractured limestone. Core 2 was cut from 1742.5 to 1751.5 m in the salt. Ten RFT pressure tests were taken in the Shetland Group of which 6 were classified as valid tests. They indicated a formation pressure in the range of 4520 to 4540 psi, being equivalent to 15.6 ppg equivalent mud weight. No obvious pressure gradient could be derived from these 6 points.

The well was permanently abandoned on 2 September 1990 as a dry well with shows.

TESTING

One drill stem test was performed from perforations in the Shetland Group from 1722 to 1740.9 m. The well flowed only salt water at a rate of 231 m3/day on a 24/64" choke. There was no trace of oil and the gas content was too low to be measured. The shut-in pressure after final build-up was 4531 psia. The maximum bottom hole temperature recorded in the test was 98.3 deg C. This corresponds to a mean gradient of 56 deg C/km, assuming 6 deg C at the sea floor. This is an exceptionally high temperature gradient for the Norwegian North Sea.

LITHOSTRATIGRAPHY & HISTORY FOR WELL: 1/6-5