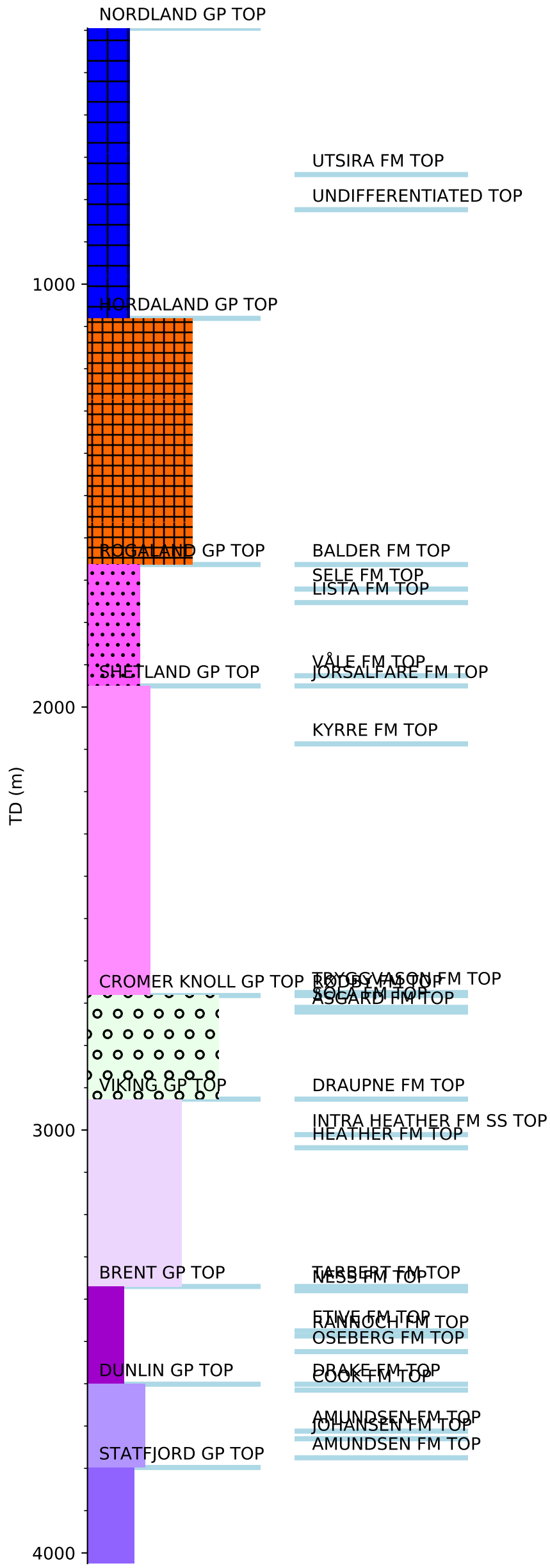

LITHOSTRATIGRAPHY & HISTORY FOR WELL: 35/11-2

Wellbore History

GENERAL

Block 35/11 is situated at the boundary between the Horda Platform and the Viking Graben just north of the Troll Field and south of block 35/8 where two gas/condensate discoveries had been made. The work obligation for Block 35/11 included three exploration wells to be drilled to 4000 metres or to Triassic sediments, one of which must test an Early Cretaceous stratigraphic play. The first of these wells, 35/11-1, was drilled in 1984 to a depth of 3361 m in rocks of Triassic age. The primary objective of that well was to assess the hydrocarbon potential of the Middle to Upper Jurassic sands in the "A" structure. No hydrocarbons were present in any of the objectives although good quality Brent sands were encountered. The second well to be drilled on the block was 35/11-2. It was designed primarily to test an Early Cretaceous stratigraphic play, interpreted seismically as a fan development with a 130 km3 closure, and reservoir thickness of 270 m. A secondary objective was the "B" structure at Brent level.

OPERATIONS AND RESULTS

Wildcat well 35/11-2 was spudded with the semi-submersible rig Treasure Scout on 20 July 1987 and drilled to TD at 4025 m in Early Jurassic rocks. The hole was drilled to setting depth for 20" casing without a riser. MWD was used, but the resistivity unit was destroyed after few meters. Conventional logs did not get past 760 m, and while attempting this; there was an intrusion of formation fluid into the hole. There was no sign of shallow gas, and heavier mud was used. The hole was opened to 26" without logging below 760 m. The reason for the problems around 760 m was probably washed-out zones. When preparing the setting of 20"casing, fluid was again flowing into the hole, and the mud weight was increased. Further drilling went without significant problems. The well was drilled with spud mud down to 1026 m, with seawater and lignosulphonate from 1026 m to 2195 m, and with a seawater/low solids polymer from 2195 m to TD.

The well penetrated the Early Cretaceous at 2682 m (prognosed at 2713 m) and intersected a 225 m thick, predominantly argillaceous/marly sequence. No reservoir rocks were penetrated. At 3011 m Intra Heather Formation sandstone was encountered, and at 3370 m the Brent Group was penetrated (prognosed at 3298 m). The Brent section was 231 m thick with reservoir quality sandstones in the Tarbert, Ness, Etive, and Oseberg Formations. It contained a 175 m gross hydrocarbon column, but the net/gross ratio is low. The logs and RFT pressure data showed a gas/water contact around 3545 m (3522 m SS) in the Oseberg Formation. Oil shows were observed in the Late Jurassic Intra Heather sandstone and throughout the Middle Jurassic Brent Group sandstones. Patchy shows persisted through the Dunlin Group and the Statfjord Formation to total depth. Organic geochemical analyses showed good source rock potential in the Draupne and the Heather Formations, the first of these being the best and more oil prone. The penetrated source intervals were immature to marginally mature, and certainly less mature than the sampled petroleum. Analysis of the DST oils indicated a common source, and the oils increased in maturity with depth.

Eight cores were cut in the Late and Middle Jurassic reservoirs (total 129 m). Core recovery was 124.9 m (97%). Four RFT fluid samples were taken. Sample RFT 1 taken at 3040.99 m in the Intra Heather Formation sandstone filled very slowly and recovered gas and mud filtrate with a light oil film. Sample RFT 2 at 3077 m in the Tarbert Formation recovered gas and mud filtrate. Sample RFT 3 at 3481.05 m in the Etive Formation recovered gas and condensate. Sample RFT 4 at3524.98 m in the Oseberg Formation recovered gas and condensate.

The well was plugged and abandoned on 4 December 1987 as a gas and condensate discovery.

TESTING

Five drill stem tests, including one in the water leg, were undertaken. The Intra Heather sandstone was tight, with a low net/gross, and was not tested.

DST 1, the water test in the lower Oseberg Formation, produced 315 m3 water/day through a 28/64? choke in the main flow. The reservoir temperature was 136 °C.

DST 2B in the upper Oseberg Formation produced at maximum 280 Sm3 condensate and 369000 gas /day through a 48/64? choke. The GOR was 1319