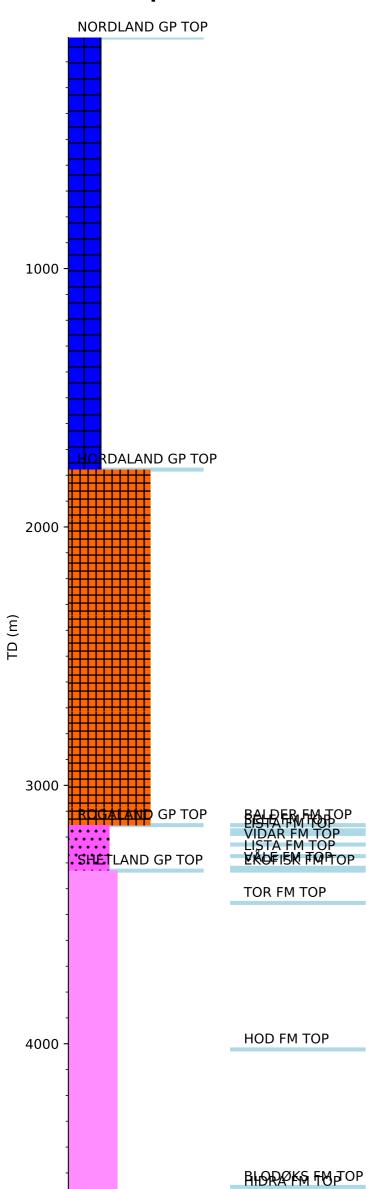
## **Groups** Formation Tops

## **Wellbore History**



CROMER KNOLL GP TOP REPRESENTED

OUNDERING DOOR TOP

MANDAL FM TOP

## **GENERAL**

Well 2/4-14 R was designed to re-establish full well control of the uncontrolled flow in well 2/4-14 by using both well 2/4-14 R and 2/4-15 S. The RKB with Neddrill Trigon is 37 m, but all depths in this account are relative to the RKB of Treasure Saga (26 m) for easier comparison with other the well bores and re-entries involved in the blow out.

Since the underground blow out occurred in well 2/4-14 in January 1989 various surveys and analyses had been conducted to monitor any flow of gas into shallow strata in the area. Gas bubbles from the site of the 2/4-13 well head were first time reported from ROV surveys in August 1989. A Sidescan Sonar Search was performed in the period from late June 1989 up to late March 1990. No gas leakage was detected by this method. A seismic surveillance study was performed in the 2/4-14 area by Read Well Services A/S in order to monitor the noise and acoustic activity caused by possible cracking due to migration of hydrocarbons into the shallow sand layers. Four seismometers were placed on the seafloor from 21 September to 2 October 1989. Analysis of these data proved seismic activity, possibly due to the pressure build-up and release of energy related to the hydrocarbon accumulation in the sand layers. Geochemical analyses of gas samples from wells 2/4-13, 2/4-14, and 2/4-15 were conducted. Variable mixes of shallow (biogenic) with deep reservoir (thermogenic) gasses were found in the samples, with the highest proportion of thermogenic gas in the depression of well 2/4-13. Seismic shallow anomalies corresponding to sands at 828, 492 and 445 m were mapped in March 1990, indicating recipients for leaking hydrocarbons.

The 2/4-14 R well program covers the phase from where the 7" liner has been set, cemented, logged and successfully pressure tested in well 2/4-15 S.

## **OPERATIONS AND RESULTS**

Jack-up rig Neddrill Trigon arrived the 2/4-14 location on 21 March 1989. A sub sea snubbing BOP was installed on top of the Treasure Saga BOP (snubbing = forcing a pipe or tubular into a well against well bore pressure). The well was tied back to the jack-up rig with a high-pressure riser system. Two snubbing units (460 and 150 K) were used for high pressure snubbing operations during clean up, killing and plugging of the well. Pressure communication with the well was established on 1 May 1989. The sheared drill pipe was reconnected. A production logging tool (PLT) was run that indicated an underground flow of 18000 bbl/day down in the bore hole. The flow probably came up the annulus, or a hole in the drill pipe below 4000 m, and out a hole in the 9 5/8" casing around 1370 m.

A noise log run in the relief well 2/4-15 S indicated a hole in the drill pipe of 2/4-14 at 4110 m. The drill pipe was then cut at 4062 m and snubbed out of hole. A taper mill was run down to a planned packer setting depth. This assembly became stuck at 3816 m, and while attempting to pull free, the drill pipe parted. The well flowed 1 minute through the drill pipe before the shear ram was activated leaving two fishes in the hole. A few days later the 9 5/8" casing parted at 869 m. The mechanical condition of the well steadily deteriorated after this, making further attempts to recover the bottom drill pipe fish difficult and time consuming.

On 28 November 1989, the decision was made to utilize the relief well 2/4-15 S as the primary kill vehicle. To assist the operation, 3 1/2" tubing was snubbed in the well to a depth of 1469 m. A wire line PLT was run into the hole below the tubing to monitor the kill operation.

LITHOSTRATIGRAPHY to the set inside 13 3/8" casing up to 140 m. Inspection with ROV immediately after completion found only sporadic gas leakage on the sea bed, and later ROV inspections after the borehole was permanently plugged and abandoned found no significant gas leakage.

The well was suspended on 6 April 1990 for later re-entry and plugging with the semi-submersible rig Treasure Saga.