PL 410 Relinquishment Report

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1. Summary and Conclusion

The evalution of PL 410 resulted in a prospect portfolio consisting of a possible extension of the Luno II discovery into the licence acreage and the Nedstrand prospect. The former was tested by appraisal well 16/5-5. The well have been defined as dry and the southernmost Luno II segment is therefore regarded as non-commercial. Prospectivity of Nedstrand was degraded due to dry wells (16/5-6 Fosen and 16/4-10 Rome) recently drilled in PL 776 and PL 544. The Fosen and Rome results increase the migration risk for the Nedstrand prospect, such that it is deemed unlikely to contain any hydrocarbons. Maturation of Nedstrand prospectivity through geophysical and geological studies does not provide enhanced prospectivity. There are consequently no discoveries in the PL 410 licence to take a DG2 (BOV) on within the licence acreage. The remaining prospectivity is considered unattractive, and a decision to relinquish the licence has been made by the partnership on the 20th of October 2016.

2. Introduction

PL 410 originally comprised 244 km^2 of block 16/5, however the licence was reduced to 133 km^2 of block 16/5 in 2015 (Fig. 1). The licence is surrounded by three discoveries; the Johan Sverdrup field in northeast, the Edvard Grieg field in northwest and the Luno II discovery in west.

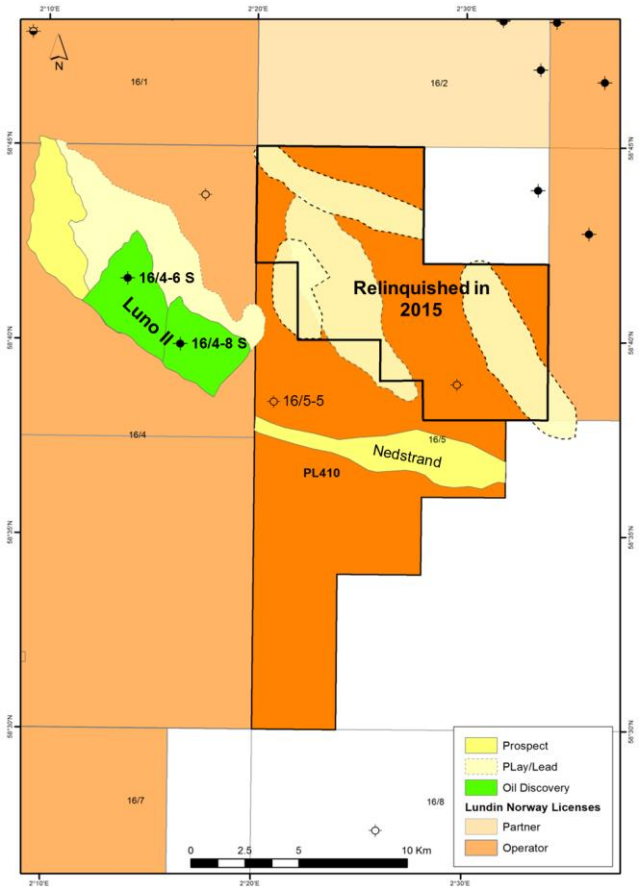

Figure 1: PL 410 location with well 16/5-5 and formerly relinquished part of the licence.

3. Licence award

PL 410 was awarded as an APA licence the 16th of February 2007, with a five years (2+2+1) initial licence period to Lundin (100% and operator). From 2nd of November 2009 Lundin reduced its share to 70% (kept operatorship) divesting 30% to Statoil Petroleum. This partnership drilled the 16/5-5 well. Licence extensions have been granted by OED in 2012, 2015 and 2016 and current deadlines are BOV 16th February 2017 and PDO 16th February 2017.

From 30th October 2015 Lundin reduced its share to 52.353% (kept operatorship) divesting 30% to Lime Petroleum and Statoil kept its shares at 17.647%. This partnership kept the licence up to relinquishment.

The APA 2006 application identified Paleocene and Upper Jurassic leads (Fig. 2). Later on the main objectives in the licence were to prove the extension of the Luno II discovery into PL 410 (well 16/5-5) and maturation of down-flank prospectivity as stratigraphic traps (Nedstrand prospect).

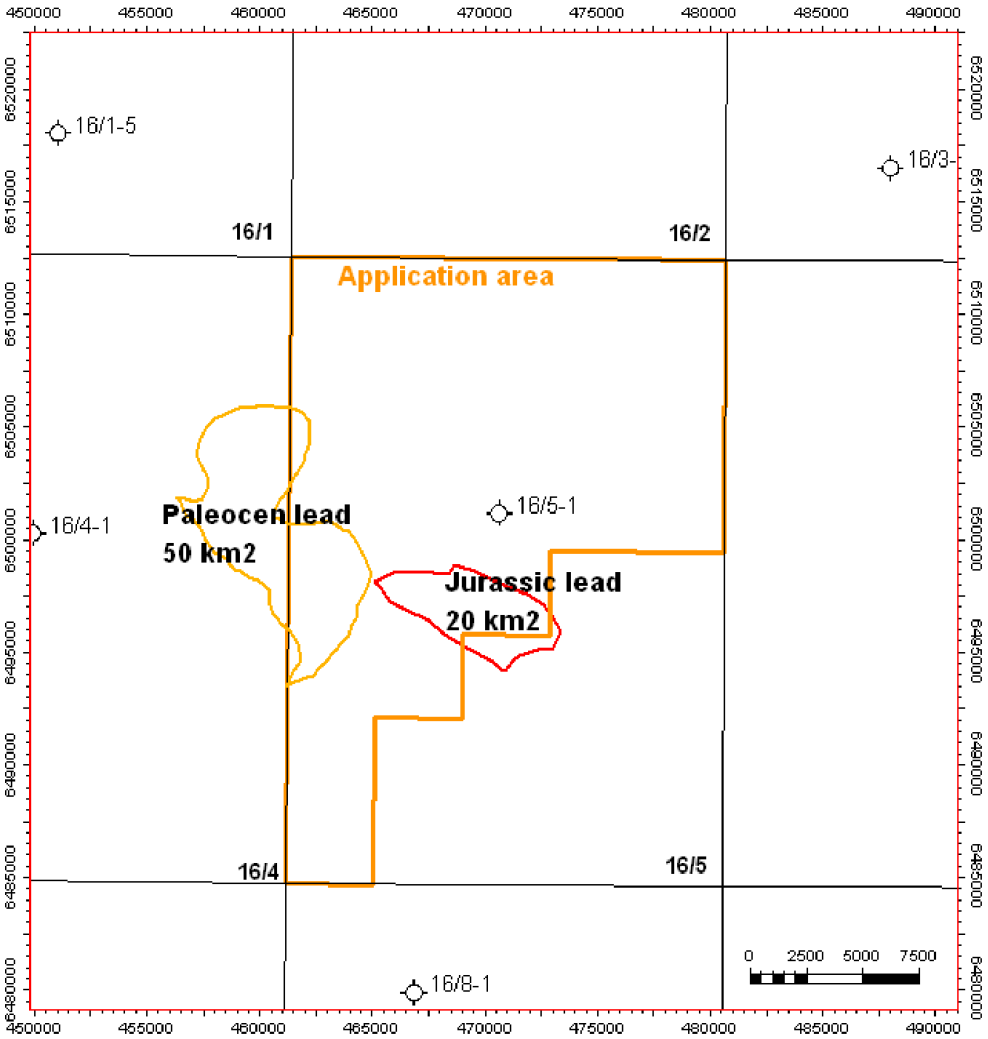

Figure 2: Leads and application area at APA 2006.

4. Completed work program and special studies

The work commitment was to acquire a minimum of 100km^2 3D seismic data and to drill a firm well within the initial licence expiry 16th February 2012. Work commitments have been fulfilled.

The commitment well 16/5-5 was drilled in Q4 2013, testing the extension of the Luno II discovery (PL 359) into PL 410. Post well evaluations include biostratigraphy, sedimentological description and interpretations and geochemical analysis.

The seismic data used for the definition of well 16/5-5 were the 3D surveys LN0902 (geostreamer) and the BroadSeis LN12M02. The main interpretation prior to drilling was done using the reprocessed cubes of LN0902R12.

The horizons interpreted from the 3D seismic data were depth-converted using calibrated stacking velocities. The neighbouring wells 16/4-6 S, 16/4-5, 16/4-1, 16/4-3, 16/1-3, 16/1-5, 16/1-12, 16/5-1 were used to adjust the depth surfaces.

A new Broadseis survey (LN12M02) was acquired by Lundin in 2012 across its multiple licences in the area. This high quality dataset has formed the basis for prospect interpretation and well placement and depth conversion since 2013. Lundin regularly undertakes re-imaging reprocessing of this dataset for different objectives across the region, creating many volume versions which are shared with Partners. Geophysical studies utilized this dataset in order to reinterpret and mature the downflank prospectivity of the Nedstrand prospect.

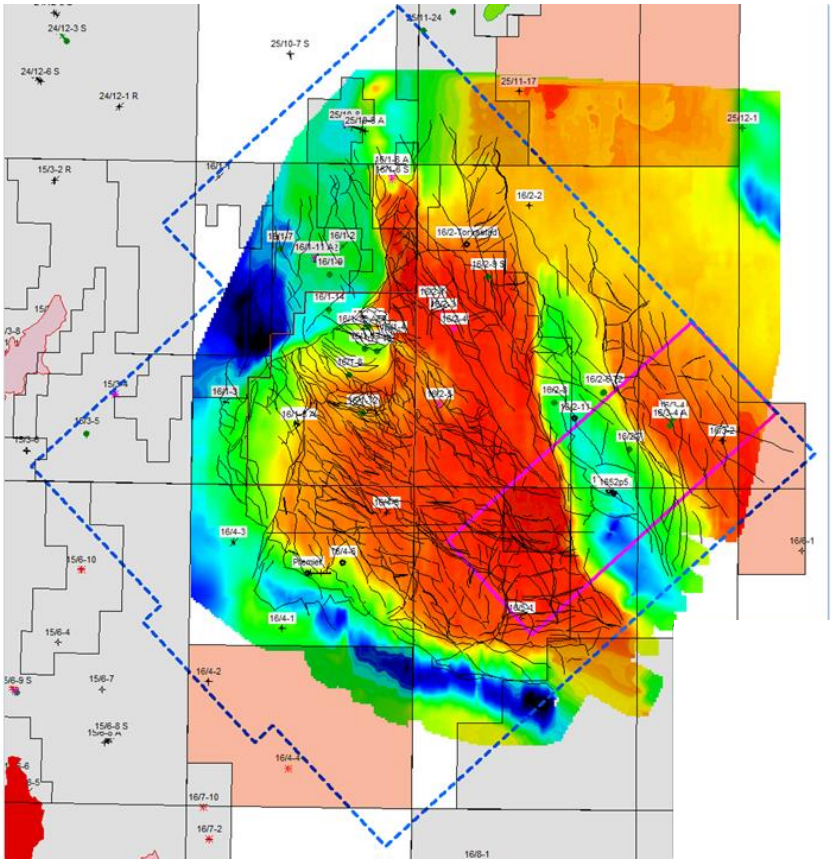

Figure 3: 3D seismic coverage of the BroadSeis LN12M02 on Utsira High.

5. Pre-drill prospectivity evaluation

Southernmost Luno II extension

The top basement map shows that the Utsira High is segmented into larger and smaller sub-basins, with the Luno II sub-basin being a series of half-grabens bounded by a steeply dipping basement surface to the east (Fig. 4).

The Luno II sub-basin consists of three main segments, the North, Central and South segments, separated by basement highs and fault zones (Fig. 5). Well 16/4-6 S tested the northern part of the Luno II Central segment and proved a thick sequence of predominantly Triassic/(?Jurassic) sedimentary fill and a 45 m oil column. The main objective of well 16/5-5 was to prove the southernmost extension of the Luno II discovery in block PL 410.

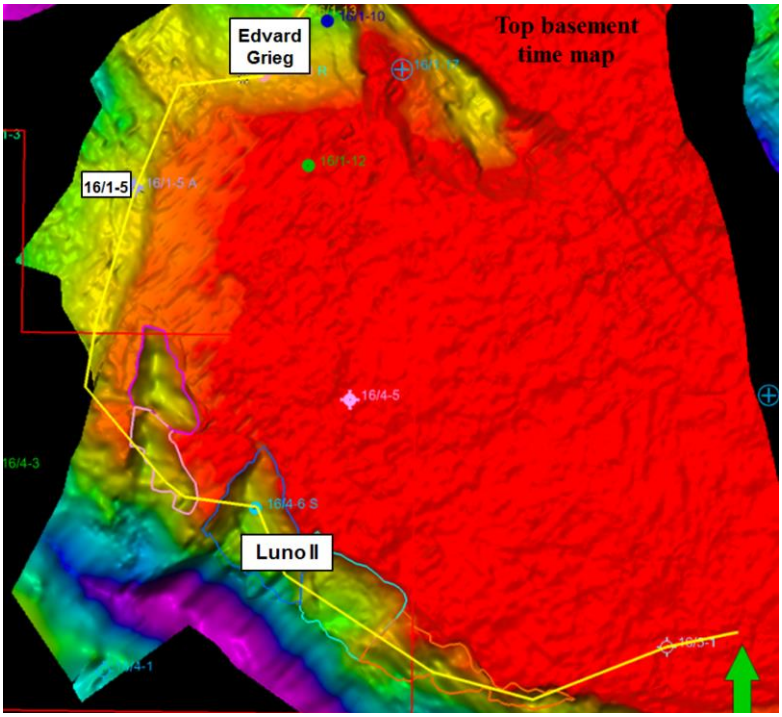

Figure 4: Top Basement time map of the Utsira High.

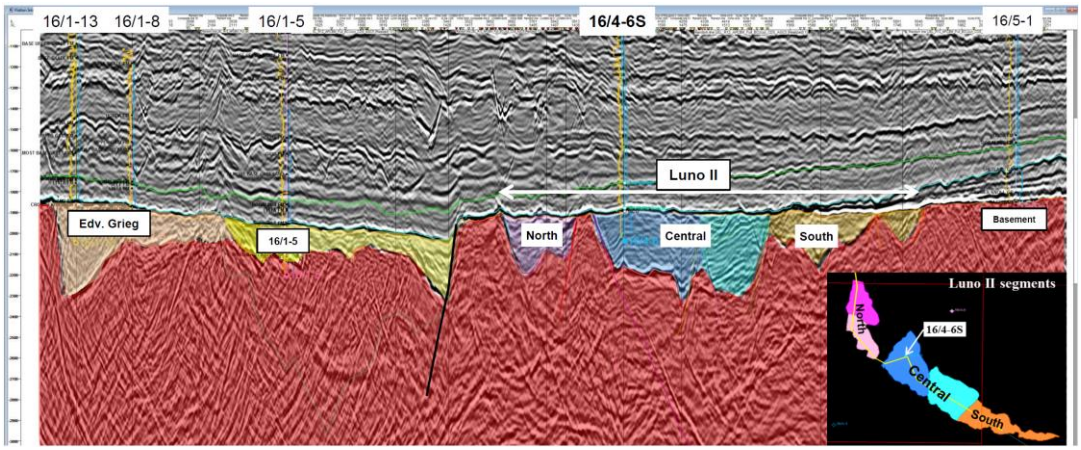

Figure 5: Geoseismic section from the Edvard Grieg Field to Luno II. For location, see Figure 4.

The Haugaland High is a regional four-way dip closure at Base Cretaceous level (Fig. 6), with sequences varying from Volgian age to basement beneath the unconformity. The Luno II structure is a combined stratigraphic and structural trap. Cretaceous marls and chalk constitute top seal and dip seal towards west and south. Stratigraphic pinch-out against basement constitutes the seal towards east and north.

The main interpreted horizons are Top Balder, Top Shetland, Top Cromer Knoll, Top Reservoir (BCU) and Top Basement. The Shetland and Cromer Knoll sections are generally thick over the eastern parts of the Utsira high, but thins dramatically towards the west flank of the high (Figure 7 and Figure 8). Cromer Knoll is only 6 m at the well position and below seismic resolution. Tuning between base Shetland and top reservoir (BCU) is evident as the Cromer Knoll section thins westwards.

Figure 9 shows the seismic well tie for the well 16/5-5. To improve the match between the seismic and the synthetics a minor bulk shift (6 ms) has been applied.

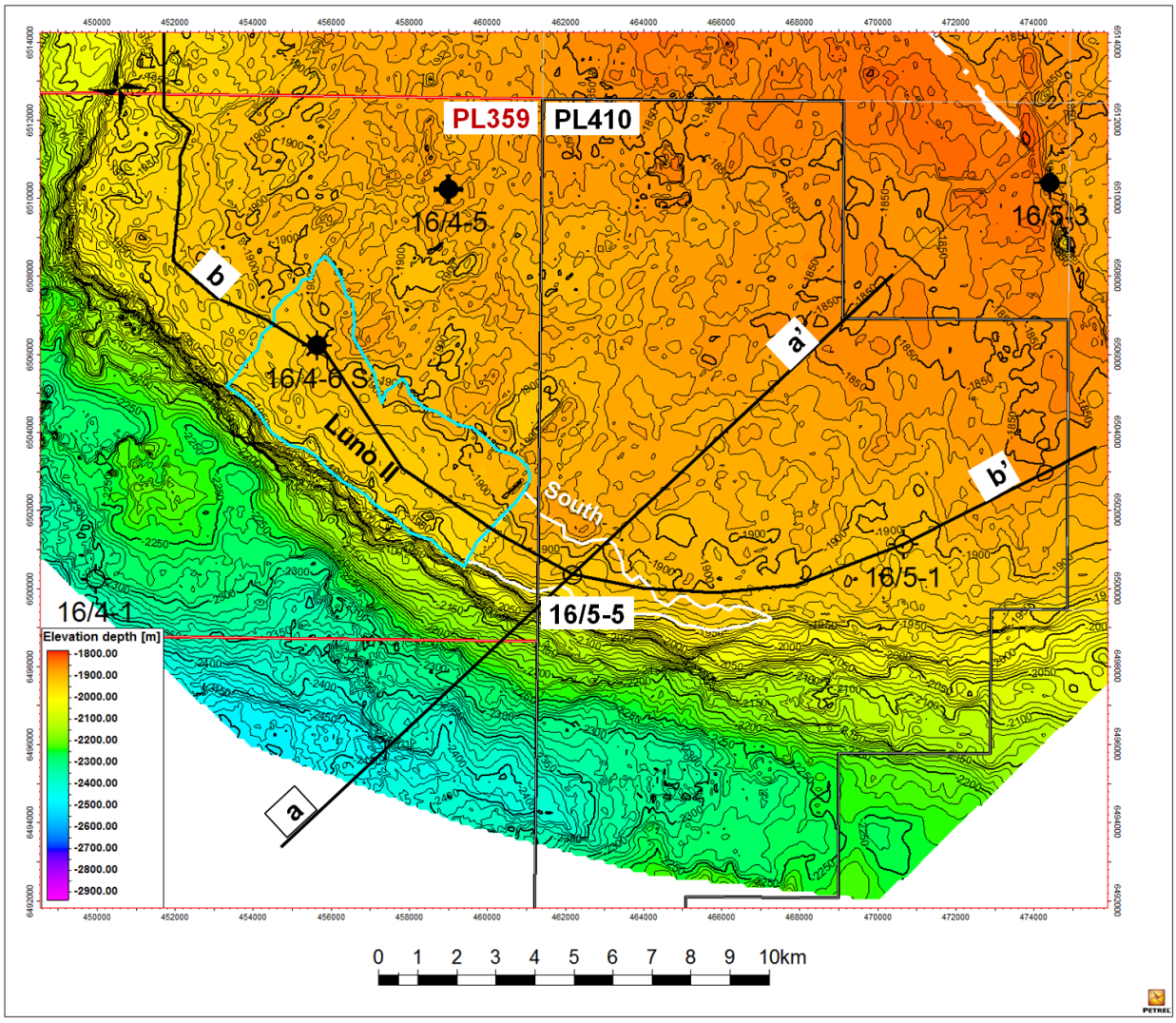

Figure 6: BCU/top reservoir depth map and the location of seismic cross sections a-a`and b-b`through well 16/5-5.

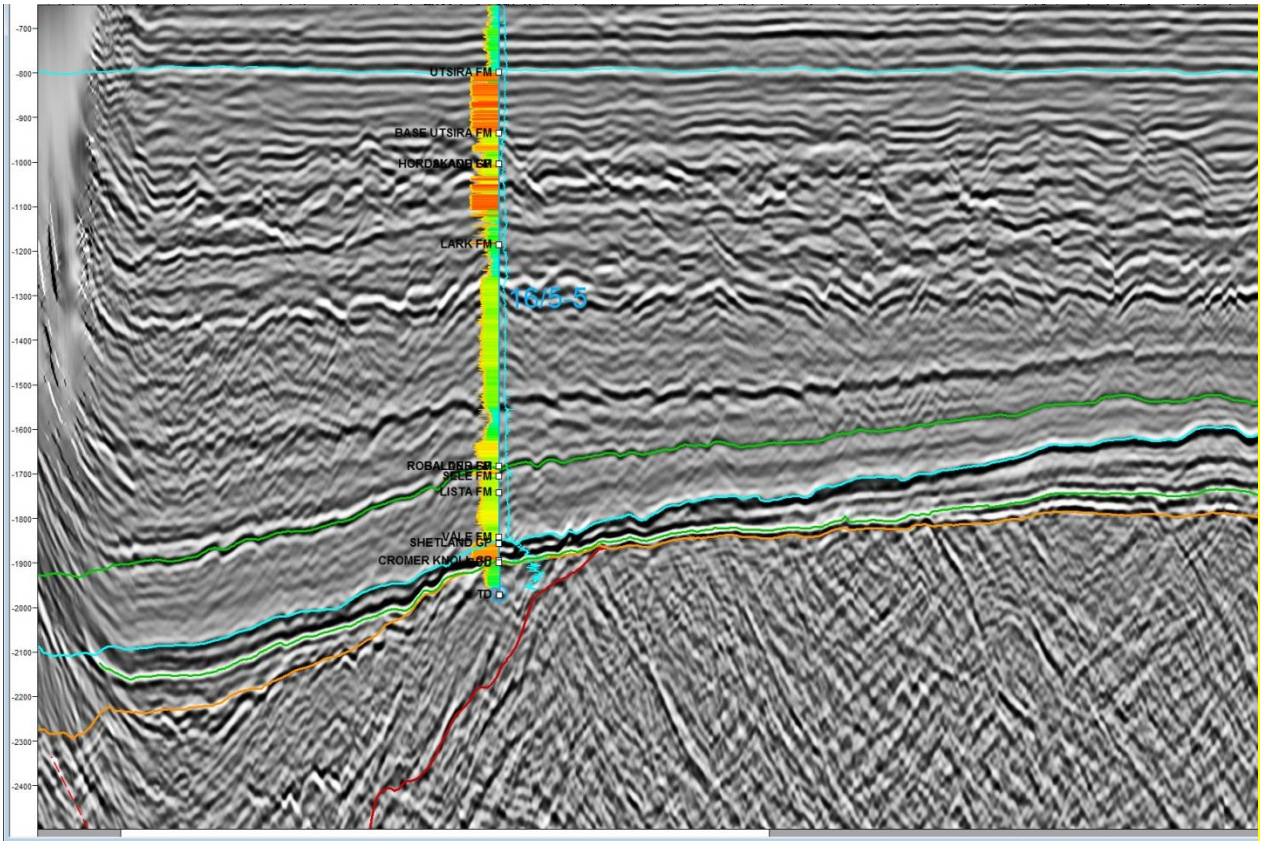

Figure 7: Seismic dip line a-a` through well 16/5-5.

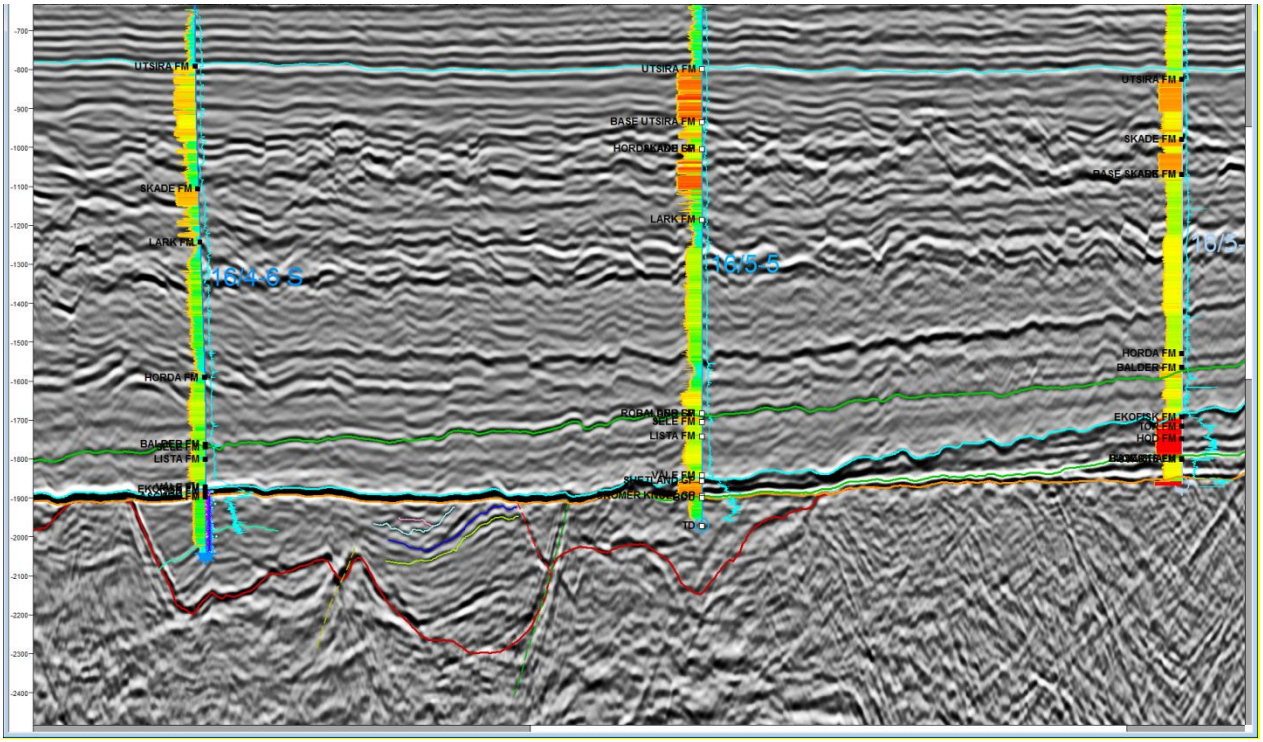

Figure 8: Seismic cross section b-b` from the Luno II discovery well 16/4-6 S to well 16/5-5 and 16/5-1.

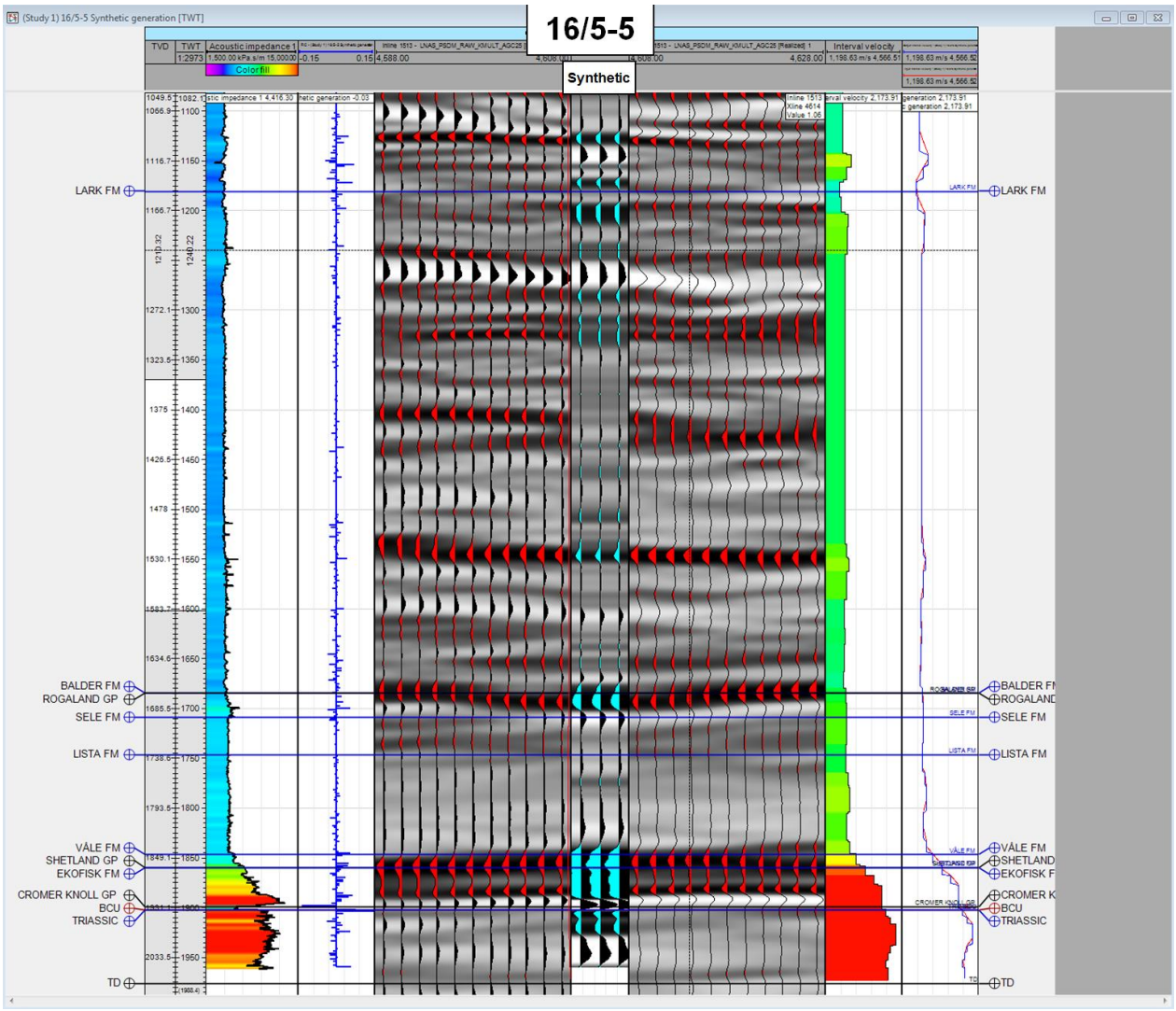

Figure 9: Seismic tie to well 16/5-5.

Nedstrand Prospect

The Nedstrand prospect envisaged untested porous Zechstein dolomites preserved in a down-faulted position on the southern flank of the Utsira High. The Nedstrand prospect is situated down-flank of the regional closure at BCU (Fig. 10), around 1950 mTVT, and consequently prospectivity relies on an efficient stratigraphic trap.

The envisaged trap comprised pinch-out and/or fault bounded Zechstein carbonates towards the Utsira High in north, and a basement high towards east and south. Lateral seal were interpreted to be provided by the stratigraphic pinch-out. Rotliegendes and older clastics and cretaceous chalk or marls were assumed to constitute base- and topseal respectively. The trap was estimated to encompass 14 km^2 with apex at 1950 mTVD, containing 80 MMstb. Additional volumes could be added proven the presence of prospective subseismic Jurassic sands below the BCU.

Nedstrand success also relied on an efficient charge from the South Viking Graben area. The dry wells 16/5-6 (Rome prospect in PL 776) and 16/4-10 (Fosen prospect in PL 544), may complicate such a charge route, and consequently increased prospect risk. Rome failure could be attributed to lack of effective hydrocarbon migration.

The prospect were intended to test a hereto, unexploited play; Zechstein dolomites. The reservoir was believed to be high-porous dolomite similar to good quality dolomite sections penetrated in Zechstein in 16/4-1, 16/1-3 and Johan Sverdrup wells.

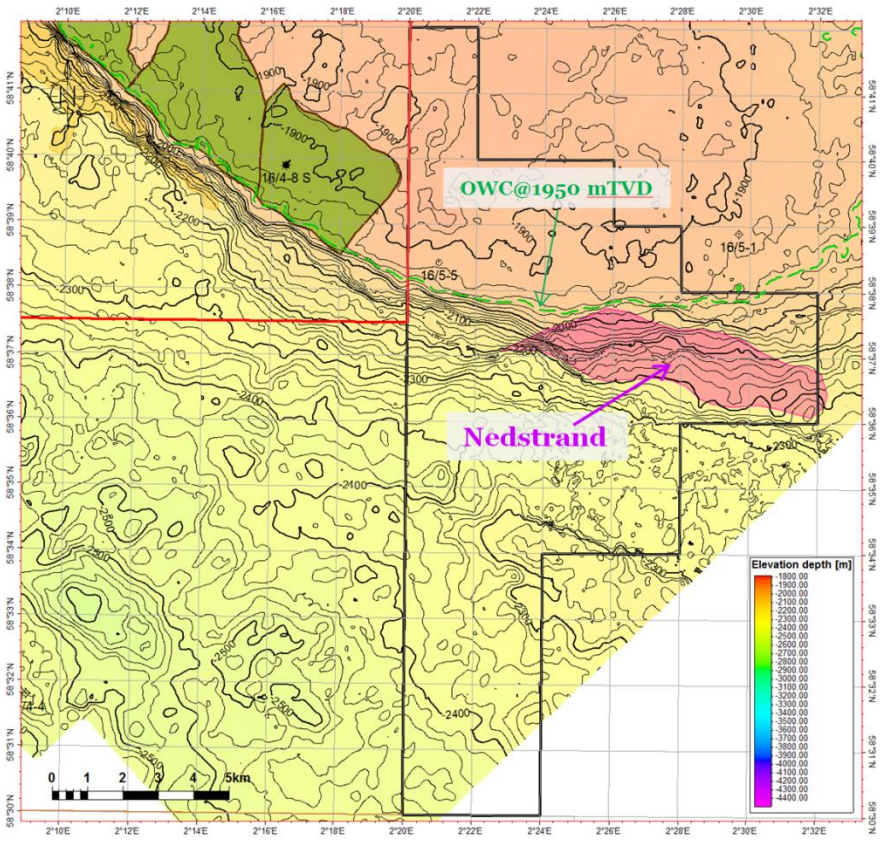

Figure 10: BCU depth map with Nedstrand (red) outline. Nedstrand is situated below the OWC and rely on an effective stratigraphic trap.

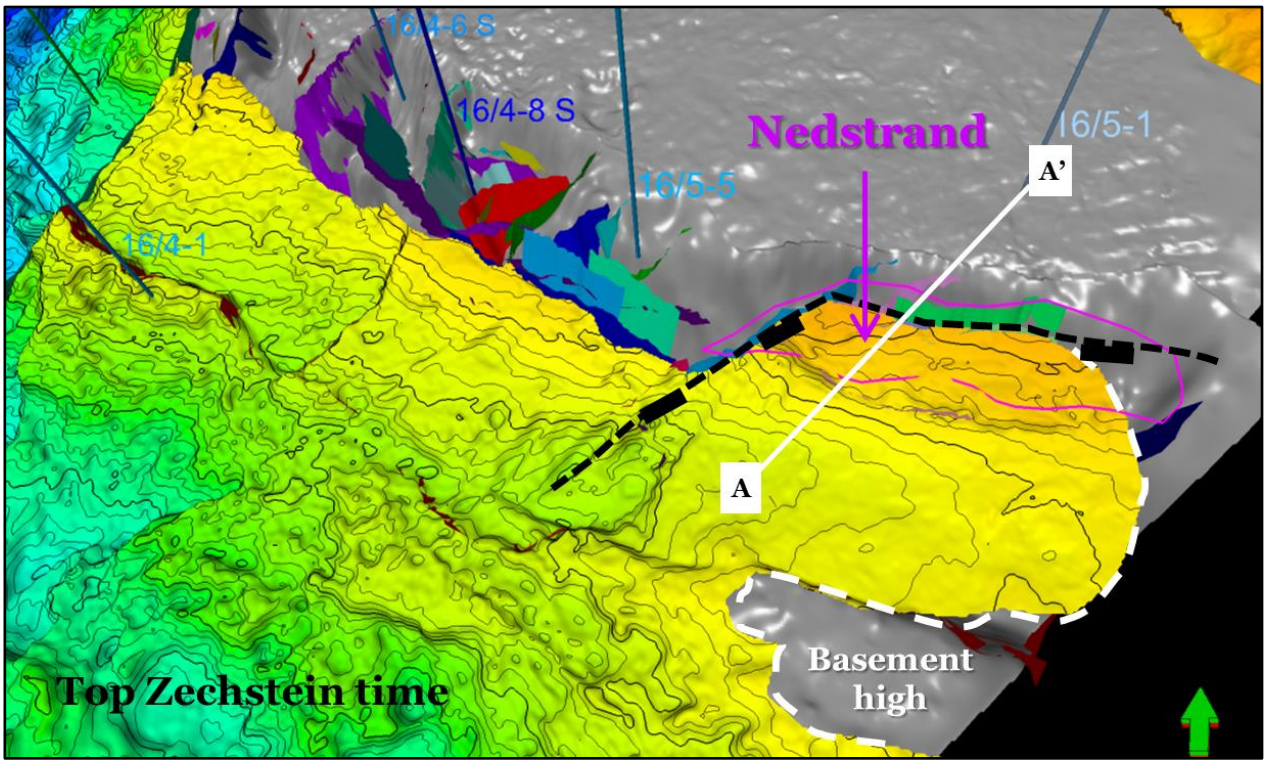

Figure 11: Top Zechstein surface onlapping to the Avaldsnes high.

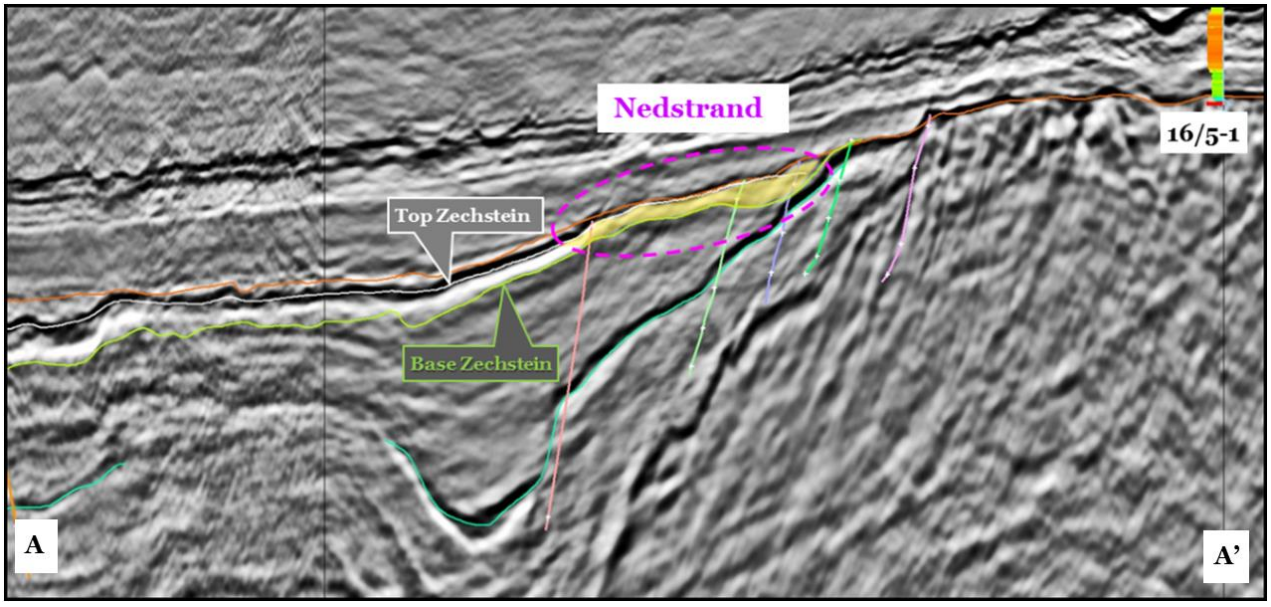

Figure 12: Arbitary seismic line a-a`across the Nedstrand prospect and well 16/5-1.

6. Well 16/5-5 results

Appraisal well 16/5-5 was drilled at the following location:

X: 462176,33 m E	Y: 6500356,59 m N	UTM Zone 31N
Lat: 58°38'25.84"N	Long: 2°20'54.44"E	ED-50
Line intersection: (LN09M02)	Crossline 1611	Inline 4757

The well was spudded on the 11.11.2013 and reached a TD of 2085.0 m RKB in the Triassic Hegre Group. The well was permanently abandoned on the 29.12.2013 as a well with shows.

Well 16/5-5 proved a thick sequence consisting of alluvial deposits of predominantly Middle-Early Triassic age. In general, the alluvial deposits showed poor reservoir quality although a 25 m interval with improved quality was seen close to TD. The cored section (uppermost 45 m of reservoir) was strongly fractured and appeared to have penetrated several fault zones.

The sandstones were partly filled with heavy bioturbated oil, however in the upper part the section was too tight to establish a pressure gradient. The reservoir pressure in the water zone was close to hydrostatic pressure, 4 bar above the Luno II discovery well 16/4-6 S, indicating a barrier between these two wells. The sampled oil in well 16/5-5 showed a similar signature to the tar in 16/4-6 S. An improved reservoir quality was found in the water zone close to TD of the well. A clear contact is not possible to establish, however no shows have been reported below the deepest oil-sample acquired at 1977 m MD.

An extensive logging acquisition program was performed in well 16/5-5 including coring, MWD/LWD and wireline logging, with fluid sampling and straddle packer (dual packer). Detailed log analysis suggests lower porosities than anticipated and lower oil saturations as a result of poor reservoir characteristics. In total six cores were cut (total 46.4 m) covering the heavy oil section.

Results versus prognosis

The quality of the depth prognosis was relatively good, and top Shetland came in 12 m deeper than prognosed. The Shetland section proved slightly thinner than prognosed. Top Cromer Knoll was mapped westwards from well 16/5-1 and the section was expected to thin dramatically towards well 16/5-5. The thickness estimate prior to drilling was very uncertain and the section proved much thinner than prognosed. Top reservoir (BCU) came in 15 m shallower than prognosed mainly due to the thin Cromer Knoll section.

The pre and post drilling correlation for the wellbore, 16/5-5, is shown in Figure 13. The average reservoir properties are provided in Table 1.

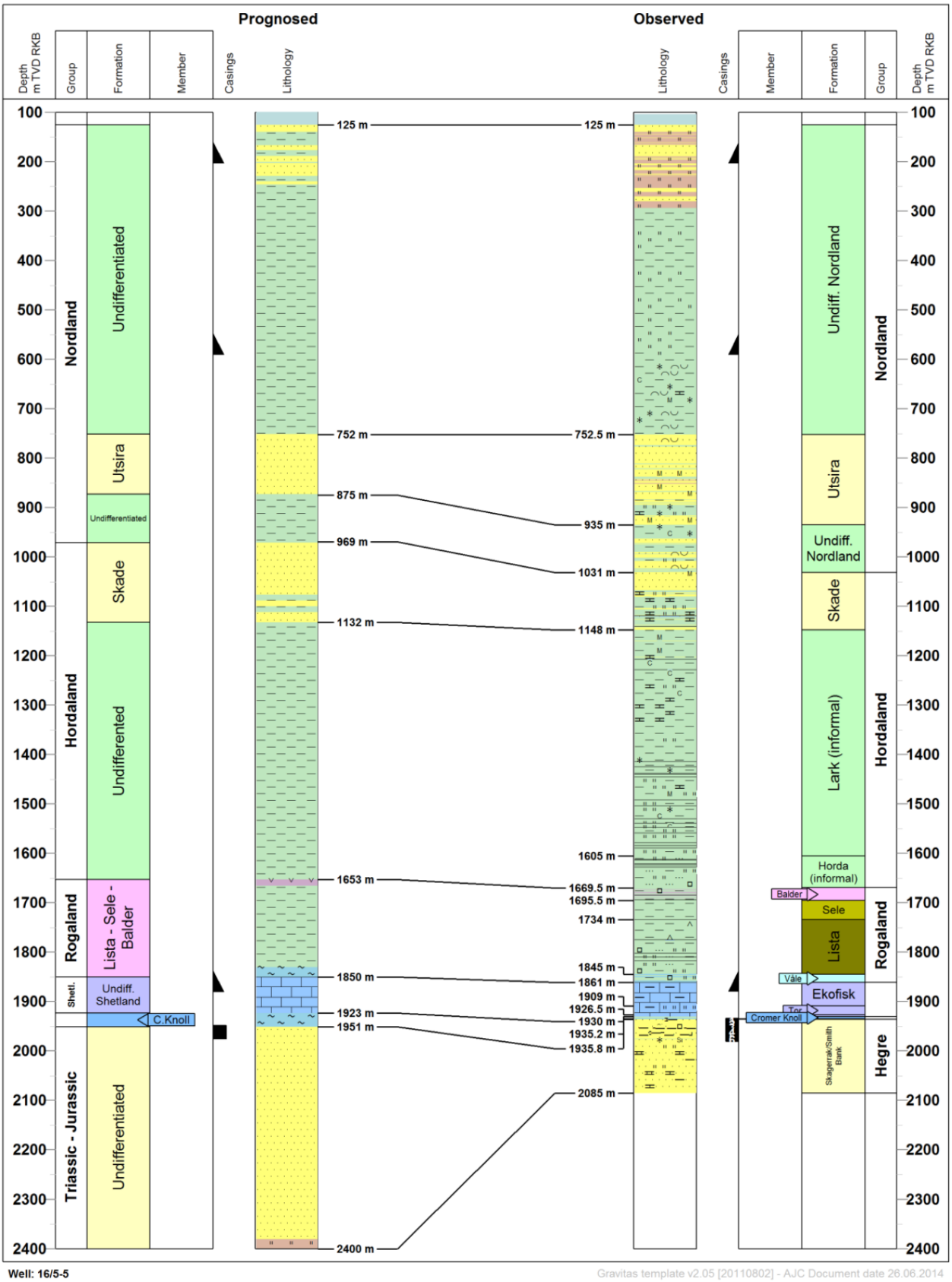

Figure 13: *Well 16/5-5, pre and post drilling correlation.*

Table 1: 16/5-5, reservoir properties.

Reservoir Summary							
Zone	**Top**	**Bottom**	**Gross**	**Net**	**N/G**	**Av Phi**	**Av Vcl**
Heavy oil	1935.42	1975	39.58	13.5	0.341	0.117	0.141
Water	1975	2400	112.35	35.3	0.314	0.132	0.197

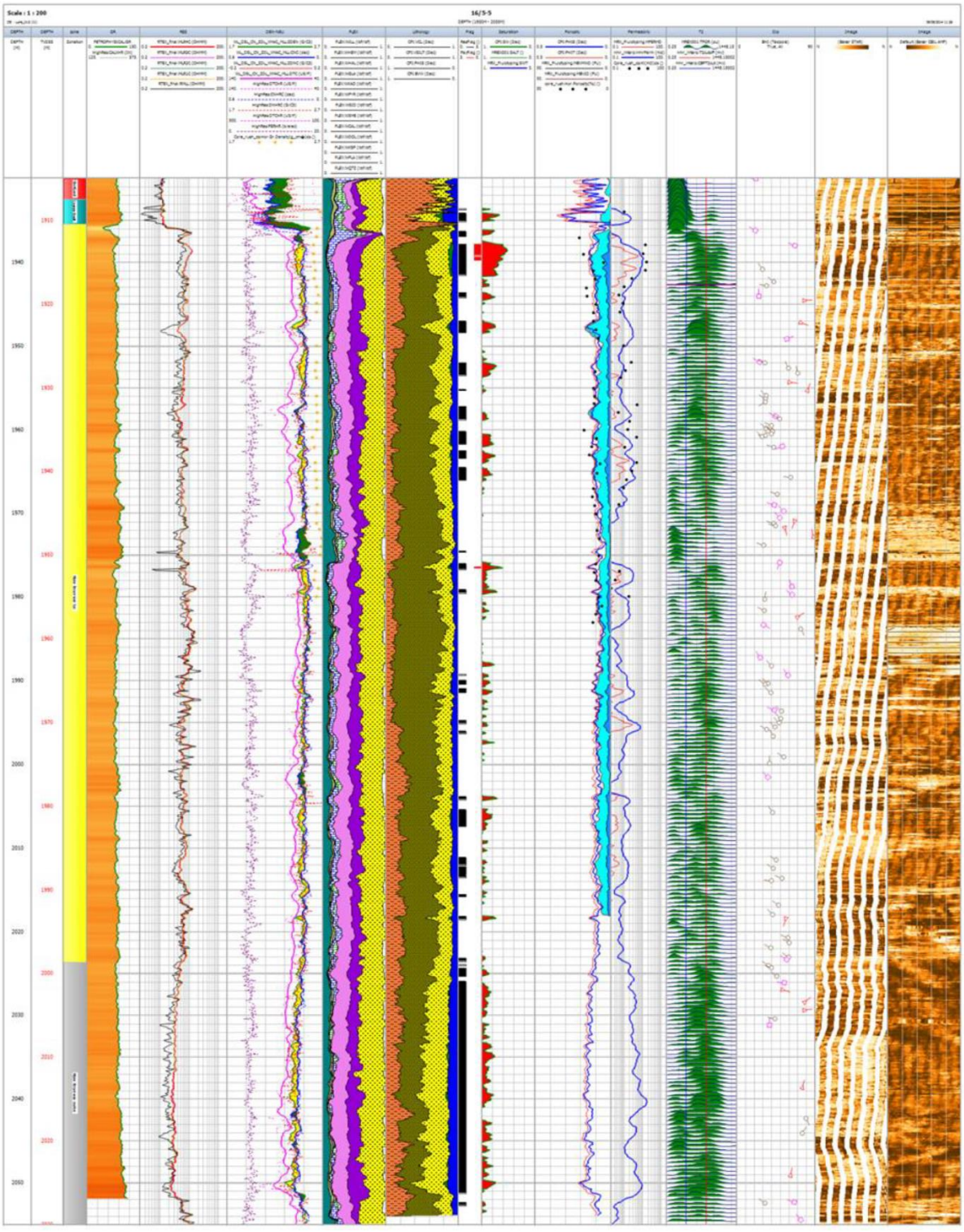

Figure 14: Well 16/5-5, Computed petrophysical interpretation.

7. Remaining prospectivity evaluation

The remaining prospectivity in PL 410 is interpreted to be low. The well drilled within the licence area (16/5-5, Luno II south segment) have been defined as dry and the segment is therefore regarded as non-commercial. However, the well identified biodegraded oil in tight reservoir sandstones of Triassic age, and a pressure difference to the Luno II discovery well. Although the well result was negative, the well proved migration of oil into the southernmost part of the Utsira High showing there is still potential for discoveries in the PL 410 area.

Remaining prospectivity within the licence is interpreted to be found as downflank stratigraphic traps along the southflank of the Utsira high (Nedstrand prospect). This play type has been matured through geophysical and geological studies. Charge is considered the main risk, and has increased as a consequence of dry wells recently drilled in the area (16/5-6 Rome prospect in PL 776 and 16/4-10 Fosen prospect in PL 544). It seems that these wells failed due to lack efficient charge, implying that downflank prospectivity on Utsira High southflank may require a HC migration route from west.

There are consequently no discoveries in the PL410 licence to take a DG2 (BOV) on within the licence acreage. The remaining prospectivity is considered unattractive at this time, and a decision to relinquish the licence has been made by the partnership.