# Relinquishment PL203B

Fig. 1 Kameleon

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# 1 INTRODUCTION

## 1.1 License Owners

Aker BP ASA 65 % (Operator)

ConocoPhillips Skandinavia 20 %

Lundin Norway AS 15 %

# 1.2 Award and Work Program

The license PL203B was awarded on the 8th February 2013 with a drill decision within three (3) years and an initial period of five (5) years following the APA Licensing 2012.

The initial partners in the license were Marathon (Op), ConocoPhillips and Lundin. In 2014 Det norske acquired Marathon Norway and later merged with BP Norge to become AkerBP in 2016.

A license extension of one year was approved by OED on 26.04.2016 to allow for re-interpretation on reprocessed 3D seismic (DN15M01) and incorporation of Alvheim (Boa structure) drilling results.

A second license extension of one and a half year was approved by OED on 27.01.2017 to allow for understanding and incorporating of the Hyrokkin well results and evaluate its impact on the remaining Heimdal prospects in PL677 and on the North Kameleon 2 prospect in PL203B. The aim was to mature a potential development solution for the area, including all prospects between Hyrokkin and North Kameleon 2 (Hyrokkin East, Surt, Helblinde N and Helblinde Mid).

License work obligations was:

1) Reprocess 3D seismic

2) Drill or drop decision within 3 years

The work obligations has been fulfilled.

# 1.3 Identified Prospectivity

PL203B is situated in the Volve Sub-basin and cover parts of 25/4 (see Fig. 1.1) . The license is located north of the Alvheim field.

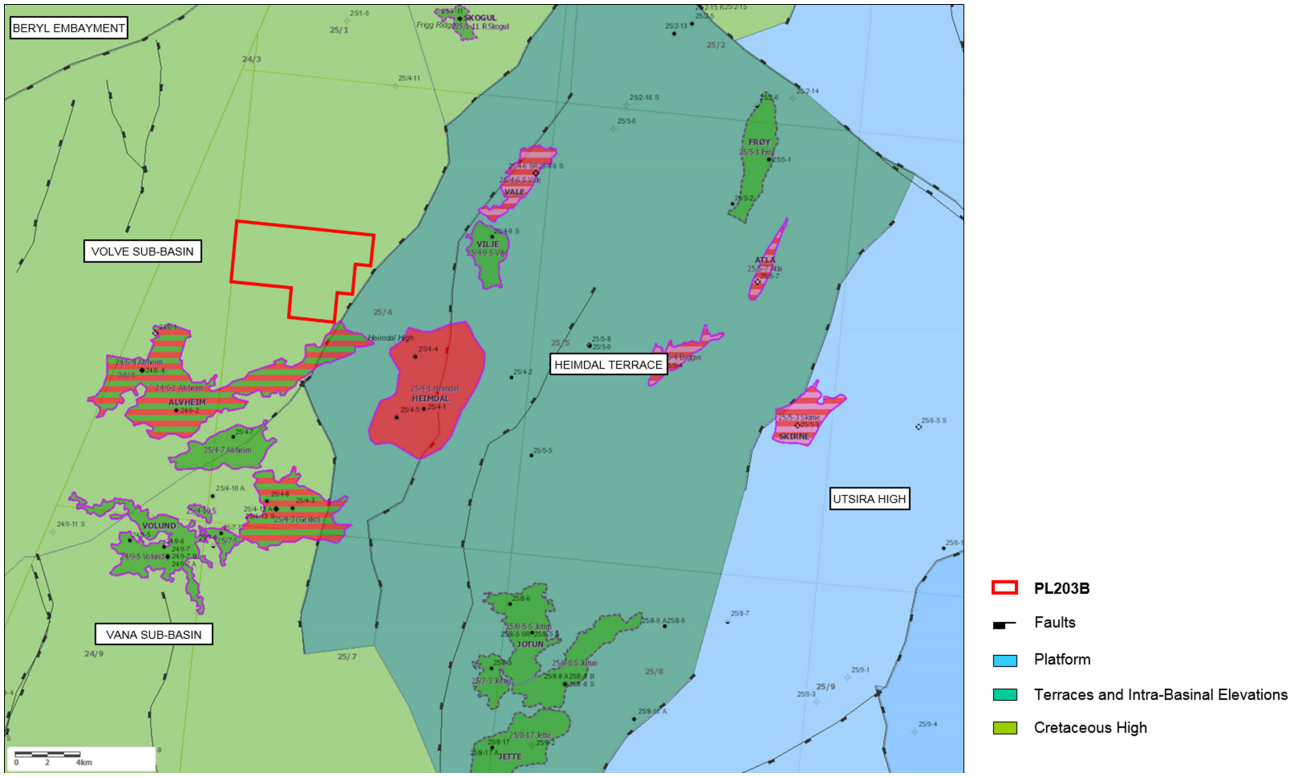


Fig. 1.1 License area and main structural elements

One prospect is identified within the PL203B acreage. The prospect is North Kameleon 2 with postulated Heimdal Formation reservoir. The prospect is seen in Fig. 1.2.

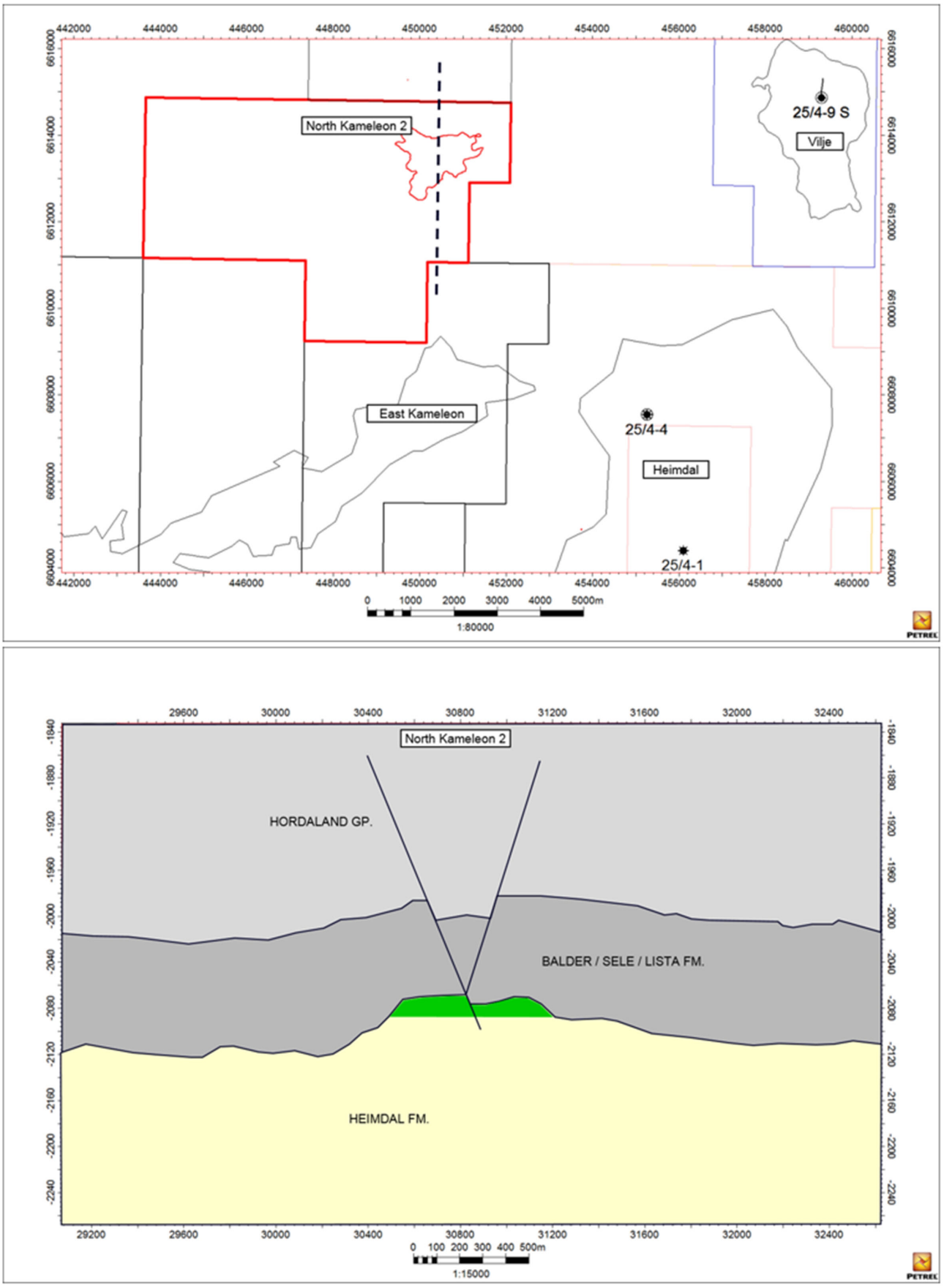


Fig. 1.2 The North Kameleon 2 prospect

# 2 DATABASE

## 2.1 Seismic Database

3D seismic reprocessing were done as described in 1.2 Award and Work Program. This was fulfilled by the reprocessed survey DN15M01 delivered in April 2016.

The Greater Alvheim reprocessing includes MC3D-NVG (NVG09/NVG10/NVG11), MC3D-SVG11, MC3D-BYL2013, MV3D-Q16203 and NH9603. DN15M01 is reprocessed using a state of the art PSDM processing flow including Complete Wavefield Imaging (CWI) comprising of Full Waveform Inversion (FWI) with Seperated Wavefield Imaging (SWIM) for quality control, TTI Velocity Model Building with dual azimuth model building over the NH9603 area and Final TTI Q-Kirchhoff Migration. This was done to increase the seismic resolution and improve the disturbed imaging beneath the shallow channels in the area. The seismic database is listed in Table 2.1and shown in Fig. 2.1

Table 2.1 Seismic database

| Fig. 2.13D Seismic survey | Survey Type | Year | Offset data | Comment |
|---|---|---|---|---|
| DN15M01 | PSDM Reprocessed 3D | 2015 | x | Detnor reprocessing including MC3D-NVG09/10/11, MC3DSVG11, MC3D-BYL2013, MV3D-Q16203 and NH9603 |

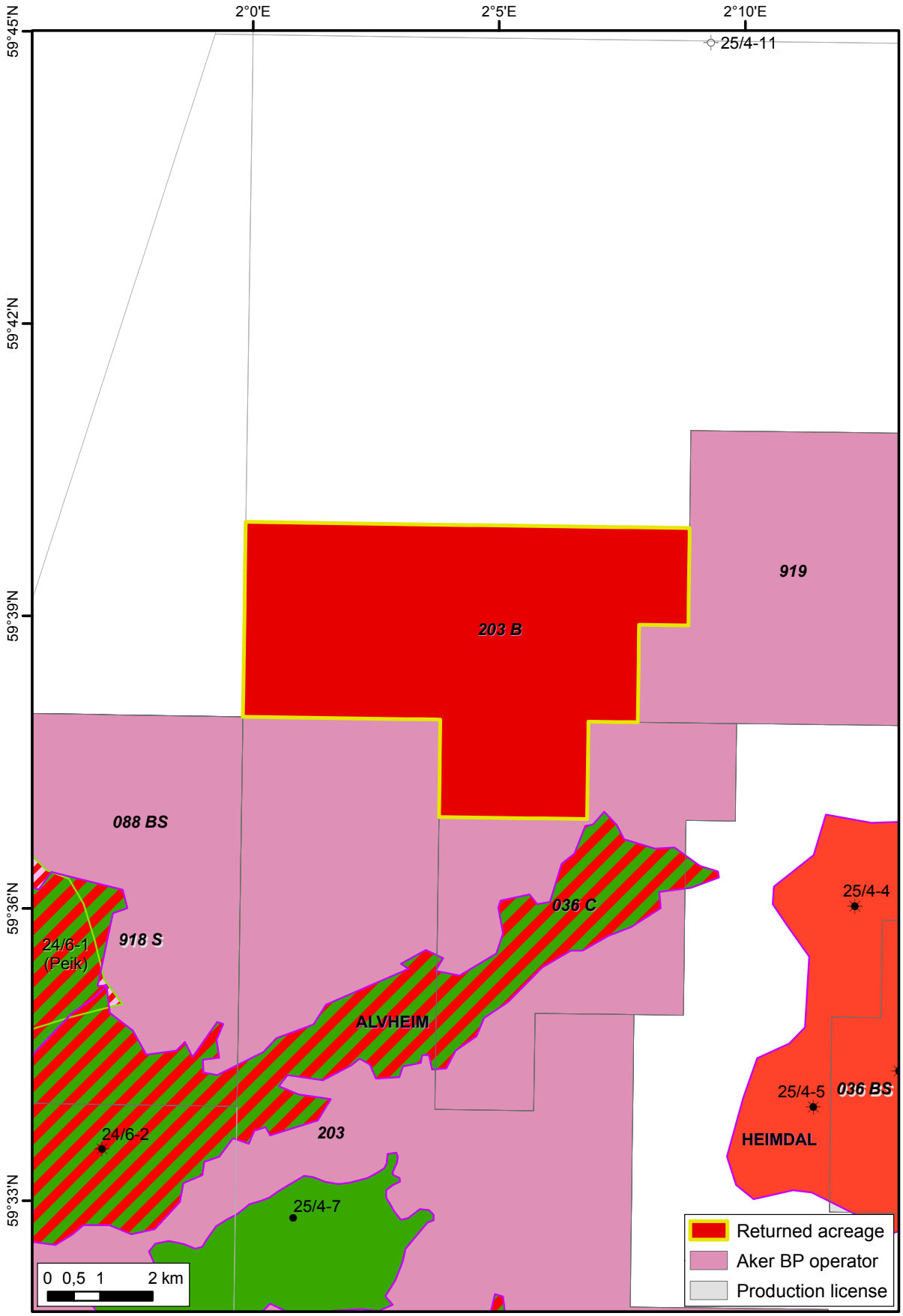


Fig. 2.1 Seismic database *Seismic database indicated by yellow polygone on map*

# 2.2 Well Data

Fig. 2.2 shows the wells used for evaluating the area. Key wells are highlighted in blue. All wells are also presented in Table 2.2 which includes well names, status, year drilled, TD depth and TD Formation.

Table 2.2 Well database

| Well | Status | Year | TD MD m | TD Formation |
|---|---|---|---|---|
| 24/6-2 | Oil and gas | 1998 | 2722 | Våle |
| 24/6-4 | Oil and gas | 2003 | 2325 | Heimdal |
| 25/4-4 | Oil and gas | 1975 | 2681 | Våle |
| 25/4-7 | Oil | 2003 | 2286 | Heimdal |
| 25/4-9S | Oil | 2003 | 2377 | Heimdal |
| 25/4-11 | Dry | 2017 | 2427 | Heimdal |
| 25/4-J-1AH | Oil and gas (observation pilot) | 2006 | 2252 | Heimdal |
| 25/4-L-1H | Oil and gas (observation pilot) | 2010 | 2690 | Heimdal |
| 25/4-L-1AH | Oil and gas (observation pilot) | 2010 | 3669 | Heimdal |

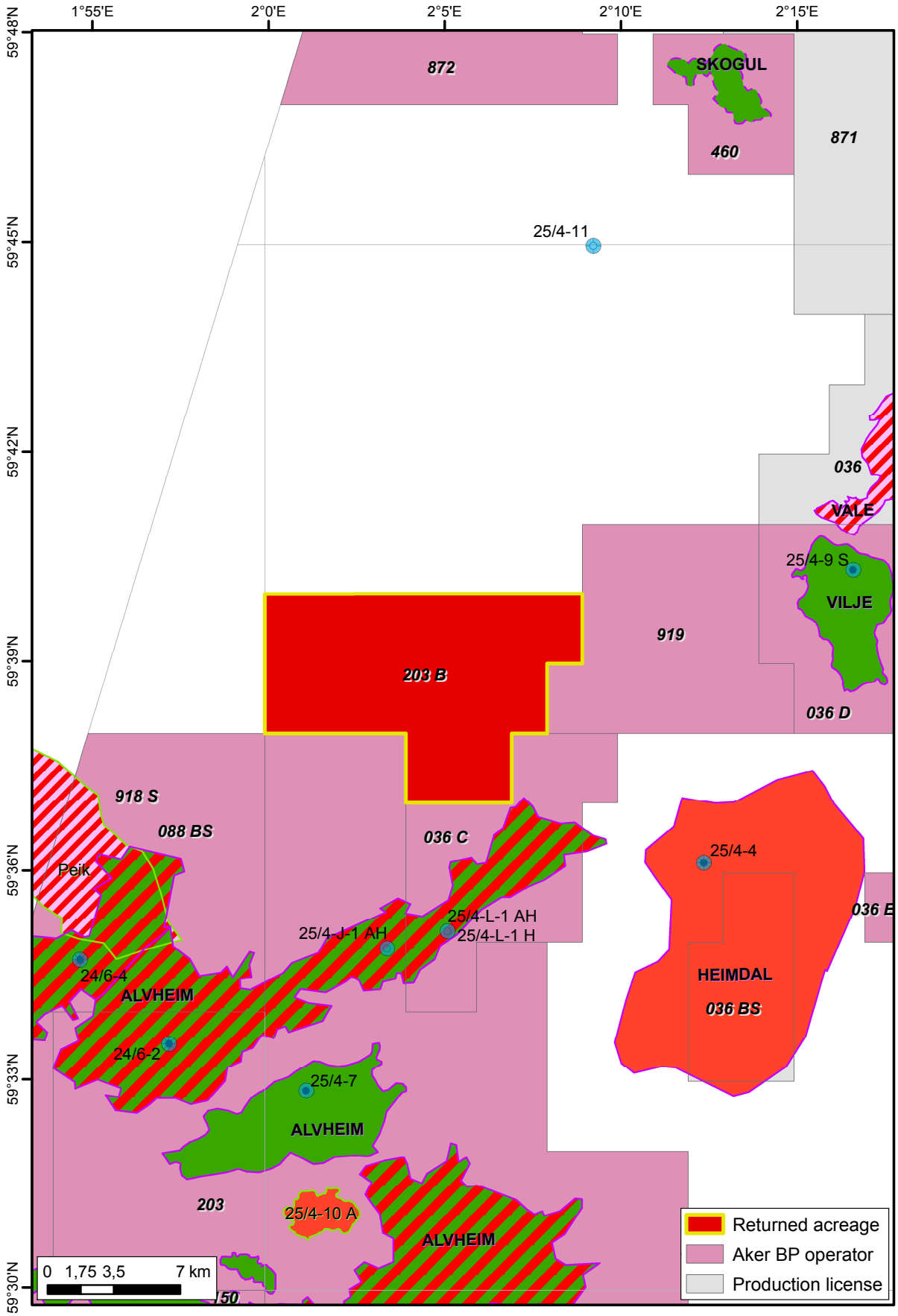


Fig. 2.2 Common well database *Key wells highlighted in blue*

# 2.3 Special Studies

### Seismic conditioning and analysis

Extensive geophysical work has been carried out on the entire dataset. This includes de-noising, spectral balancing and variable time adjustment of every angle stack to optimize for further AVO work. Coloured inversion for every stack and EEI cubes (Intercept vs Gradient rotations) resulting in lithology and fluid cubes are also produced.

### Spectral decomposition

Spectral attribute analysis through spectral decomposition (Partyka et al. 1999) on DN15M01 has been performed at several stratigraphic levels. The spectral decomposition was carried out in order to understand reservoir distribution, in particular to enhance the imaging of depositional structures and injectites. Spectral decomposition is a frequency transform of a relatively short time window to capture details from a certain stratigraphic interval. By decomposing the signal into discrete frequency bands, some details not distinguished in a full bandwidth signal will become visible. In the case of a discrete layer in a background model, low frequencies will tune at thicker intervals than high frequencies. By exploiting RGB colour blending techniques, the discrete frequency components can be blended to illustrate thickness changes, highlighting depositional features and exploring for anomalies related to hydrocarbons. If a fluid contact is present, this will also impose a tuning response towards a dipping reservoir. Results from these studies are integrated with the prospect evaluation for better evaluation.

### OGS

OpenGeoSolution based in Calgary, Canada carried out a spectral inversion and curvature analysis study on the whole DN15M01 dataset. Spectral inversion maximises the detection and resolution of layering that can be characterised using the bandwidth of available signal. This is done by uncoupling the source wavelet shape from the interference profile within the bandwidth of usable signal. Traditional techniques ink resolution and detection to the source wavelet shape in context of a single layer embedded in a quiet background. Spectral inversion on the other hand, relates resolution and detection to the available signal bandwidth, signal-to-noise ratio, the complexity of the local layering architecture, and the complexity of impedance contrasts within the local distribution of layering.

# 3 REMAINING PROSPECTIVITY

## 3.1 North Kameleon 2

The North Kameleon 2 Prospect is located in block 25/4, in PL203B, approximately 8 km north of the East Kameleon structure of the Alvheim Field and 9 km west of the Vilje Field. See Fig. 1.2. Top Reservoir time and depth maps are shown in Fig. 3.1 and Fig. 3.2, respectively. Seismic and geological profile are shown in Fig. 3.3.

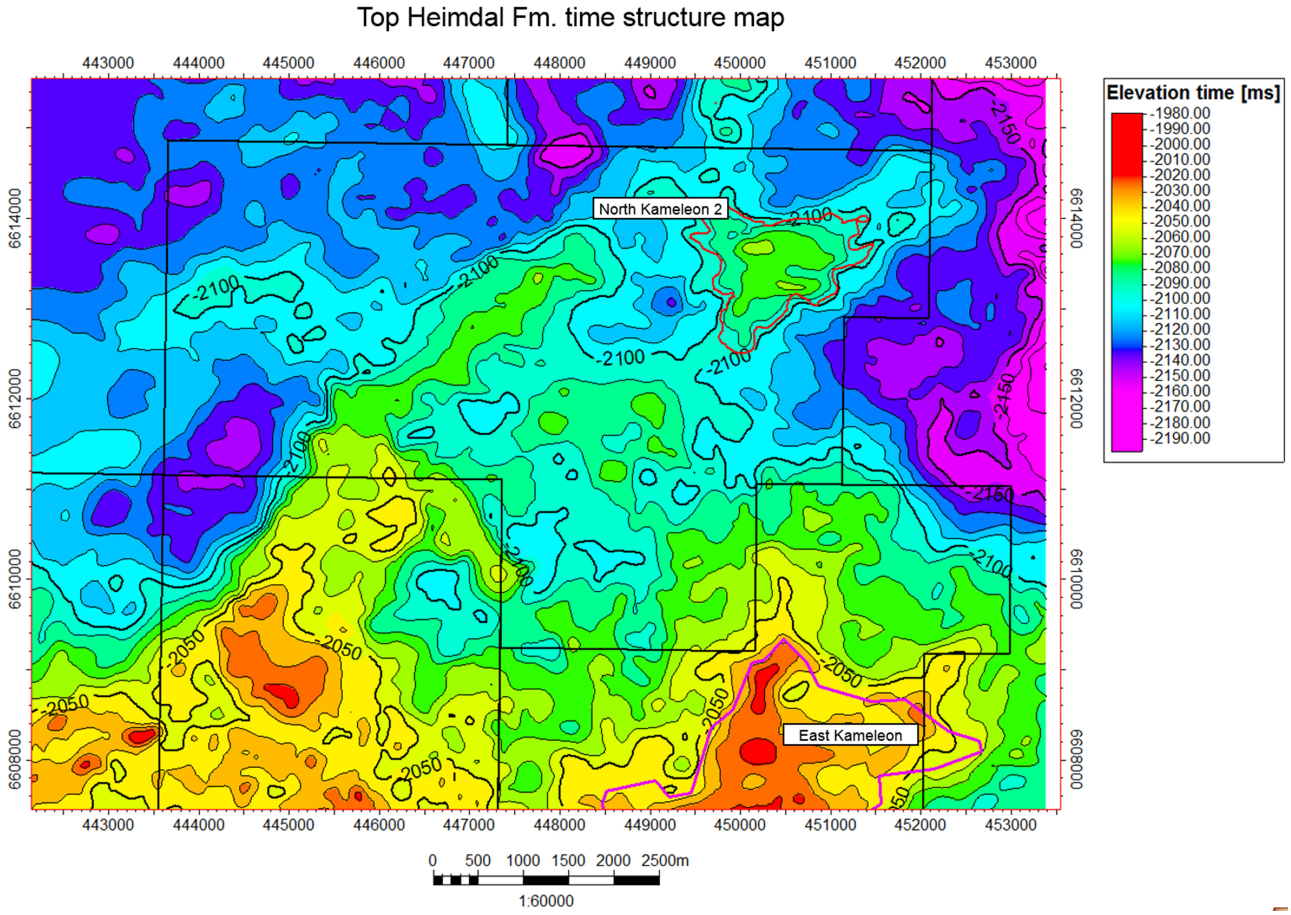


Fig. 3.1 Top Heimdal Formation time structure map

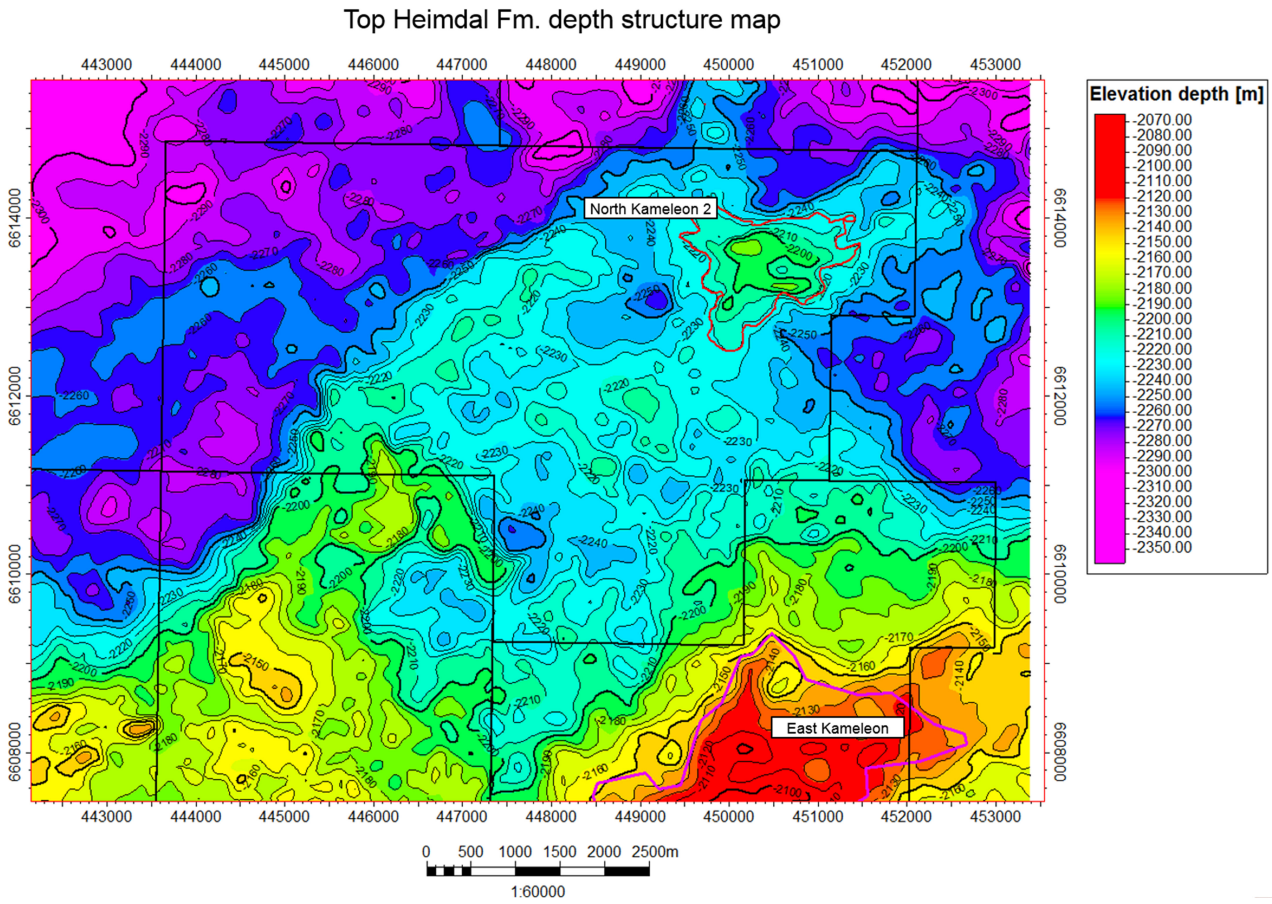


Fig. 3.2 Top Heimdal Formation depth structure map

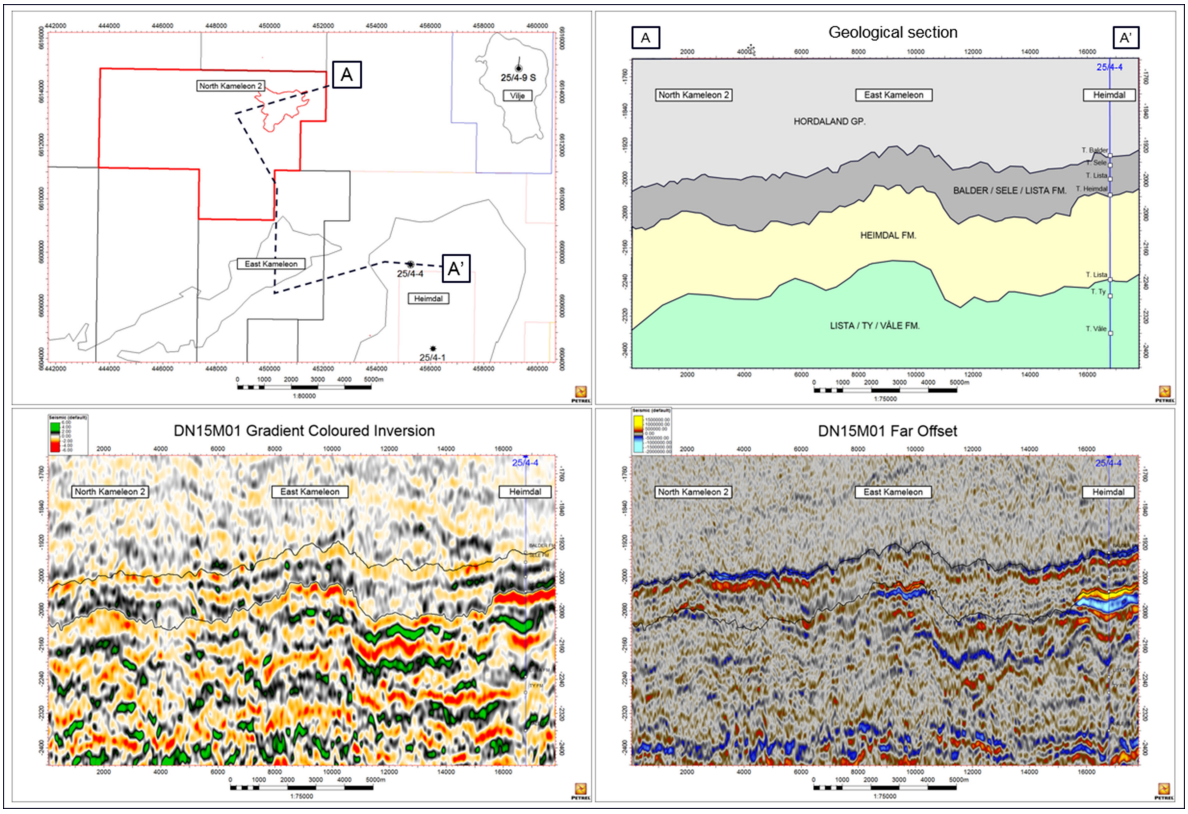


Fig. 3.3 Seismic and geological profile

The North Kameleon 2 Prospect is primarily a 4-way dip-closure in the Heimdal Formation which contains an area of bright negative far stack amplitudes within the crestal portion of the structural 4-way (Fig. 3.4). The far stack response is clearly seen in the seismic data, but shows a patch/ noisy charachter with poor amplitude conformance to structure towards the south. Spectral decomposition images outline a narrow channel feature within the upper section of the Heimdal Formation draping the North Kameleon 2 4-way dip closure (Fig. 3.5). An improved far offset amplitude conformance to structure can be seen within the outlines of this channel feature, but gives small non-economic volumes. Patchy bright far offset amplitudes can also be seen within the likely channel feature off structure towards the northeast. This, in addition to the dry Hyrokkin well to the north, has reduced the North Kameleon 2 chance of success from 0.81 to 0.63.

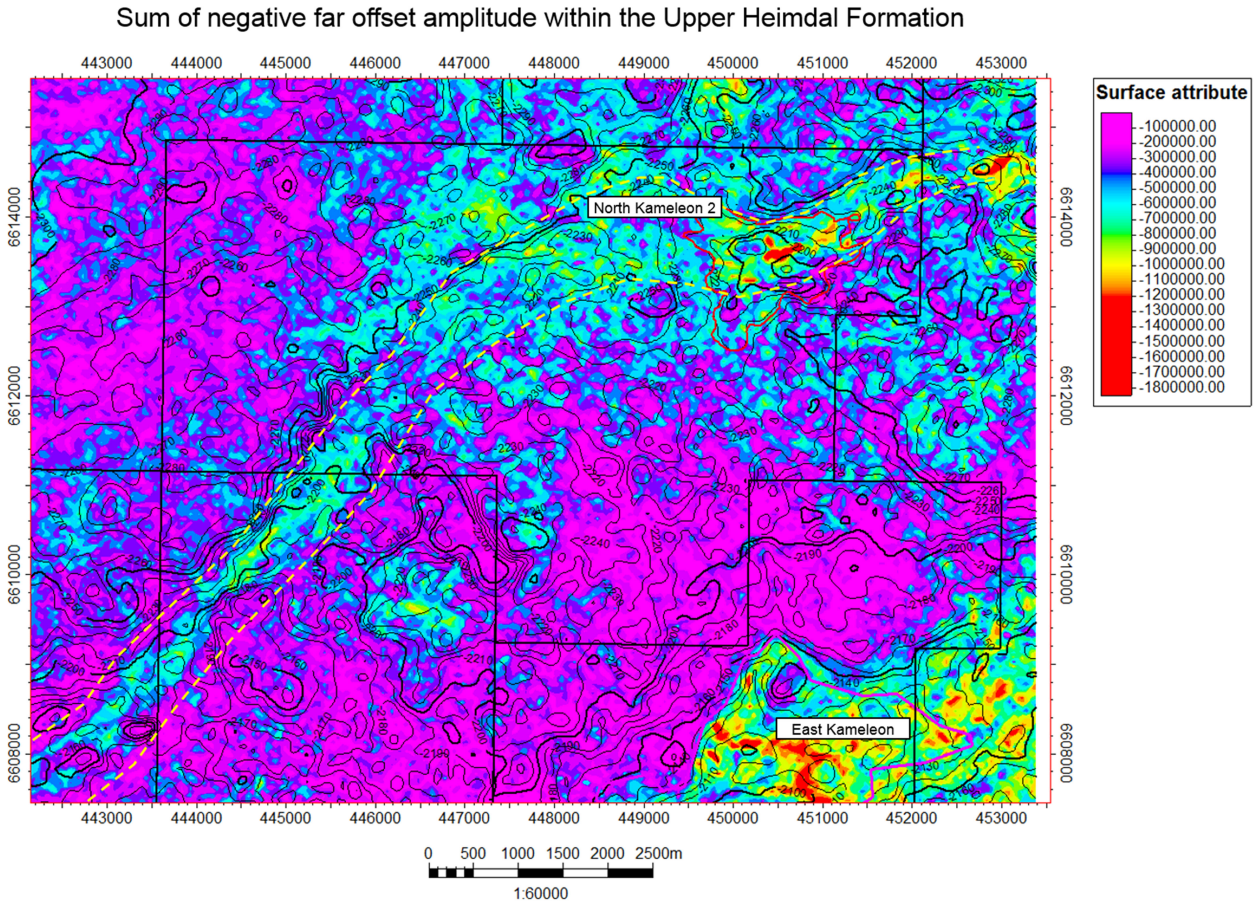


Fig. 3.4 Sum of negative far offset amplitude within the Upper Heimdal Formation.

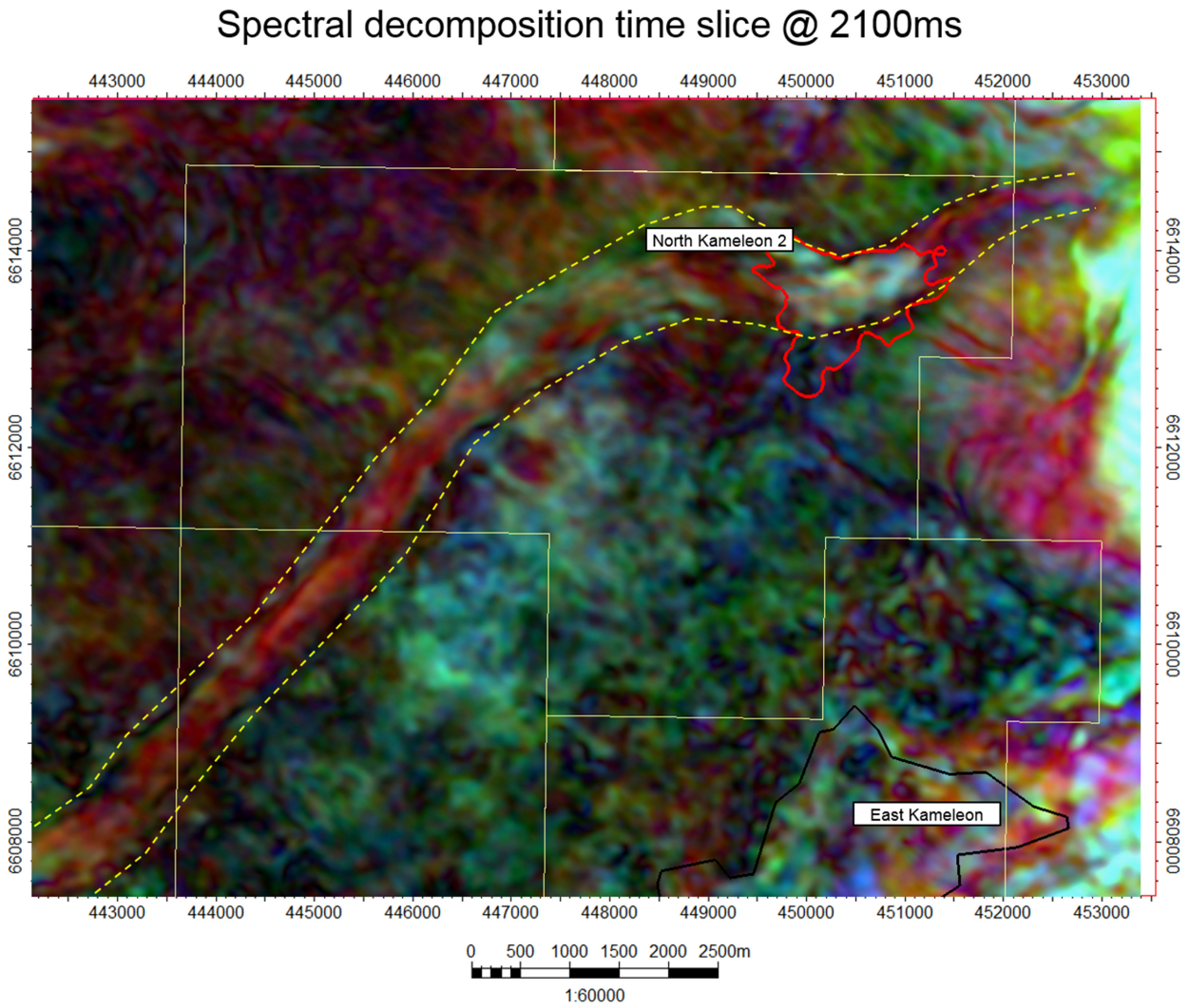


Fig. 3.5 Spectral decomposition time slice at 2100ms

# 4 CONCLUSION

The PL203B has one prospect, North Kameleon 2, with a relatively high CoS but with too limited hydrocarbon volumes for a potential tie-back to existing facilities like Alvheim. Since the estimated volumes of North Kameleon 2 are below the minimum economical field size, a positive drill decision is not interesting. The North Kameleon 2 volumes are shown in .

Table 4.1 North Kameleon 2 volume assessment

| PL203B | | | | | Resources IN PLACE | | | | | | Resources RECOVERABLE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Low | | Base | | High | | Low | | Base | | High | |
| CATEGORY | RESERVOIR LEVEL | HC | RF (%) | POS (%) | Oil ($MSm^3$) | Gas ($GSm^3$) | Oil ($MSm^3$) | Gas ($GSm^3$) | Oil ($MSm^3$) | Gas ($GSm^3$) | Oil ($MSm^3$) | Gas ($GSm^3$) | Oil ($MSm^3$) | Gas ($GSm^3$) | Oil ($MSm^3$) | Gas ($GSm^3$) |
| PROSPECTS | | | | | | | | | | | | | | | | |
| North Kameleon 2 | Heimdal/Paleocene | Oil | 40 | 63 | 2.03 | 0.17 | 2.81 | 0.23 | 3.97 | 0.33 | 0.79 | 0.07 | 1.12 | 0.09 | 1.62 | 0.13 |

# 5 REFERENCES

**Partyka et al. (1999):** Interpretational applications of spectral decomposition in reservoir characterization, The Leading Edge, Vol.18, 353- 360.