

PL 819 Licence Lapse report

Part of blocks 25/8, 9, 11 & 12



pointresources

PL 819 Licence Lapse Report

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1 History of the production licence

Summary

PL 819 (Figure 1.1) was awarded as part of the APA 2015 licence round on the 5th of February 2016. The initial period was set to 6 years (2+2+1+1), of which the first decision, a drill or drop, is due on the 5th of February 2018.

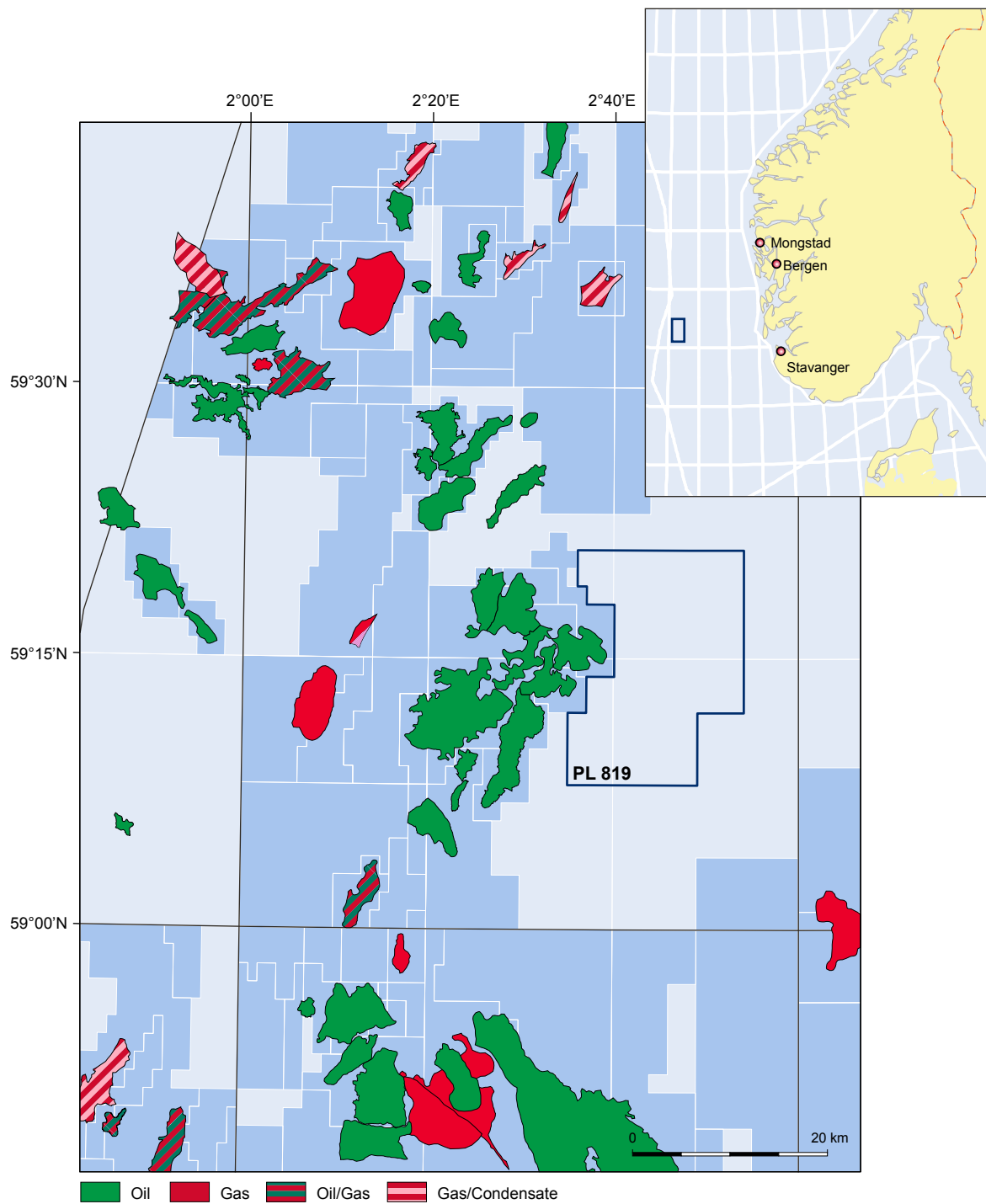


Figure 1.1 PL 819 Location map
 North Sea, parts of block 25/8, 9,11 and 12.

Participants

Suncor Energy Norge AS is operator (60%) with partner Point Resources AS (40%).

Work Commitment

The work commitment of reprocessing 3D seismic has been fulfilled (2017).

Meetings held

MC meetings were held at least once a year in accordance with JOA article 2.1.

Below is a list of the meetings held during the licence term.

1. ECMC start-up meeting on 22/03/2016 at Suncor offices in Stavanger.
2. ECMC meeting on 20/10/2016 at Suncor offices in Stavanger.
3. EC Work Meeting 15/02/2017 at Suncor offices in Stavanger.
4. Core Workshop 13/06/2017 at Weatherford Laboratories in Sandnes.
5. ECMC meeting on 09/11/2017 at Suncor offices in Stavanger.

Reasons for licence lapse

The Pleiadene lead has been re-evaluated based on new reprocessed seismic and integrated geological and geophysical studies during the licence period. The geological model suggests that reservoir sands could exist over the lead area and shale out towards east, but a trap is not mappable on the available seismic data and thus conceptual.

No more technical work can be done on the existing data to further de-risk the trap definition.

2 Database overviews

2.1 Seismic data

The seismic database used in the APA 2015 comprised public 2D and 3D seismic surveys covering the licence acreage listed in Table 2.1 and shown in Figure 2.1.

Table 2.1 Seismic database

Seismic Survey	NPDID	Survey Type	Survey Year	Status	Comments
Common Database					
SUN17M01	-	3D	2017	Licence owned	PSDM Broadband, merge of surveys: NH9301(3599), ST9707(3886) and LN1002(7284).
PGS Mega survey	-	3D	-	Multi-Client	
APA 2015 Database					
LN1002	7284	3D	2010	Public	
PGS Mega survey	-	3D	-	Multi-Client	
TLGS-78	2313	2D	1978	Public	
SH8705	3036	2D	1987	Public	
GNSR-91	3391	2D	1991	Public	

The common database for PL 819 also includes SUN17M01 (Figure 2.1), which is a 3D reprocessing and merge done as part of the work program. DownUnder GeoSolutions (DUG) performed the broadband reprocessing which included both a fast track PSTM and full processing PSDM.

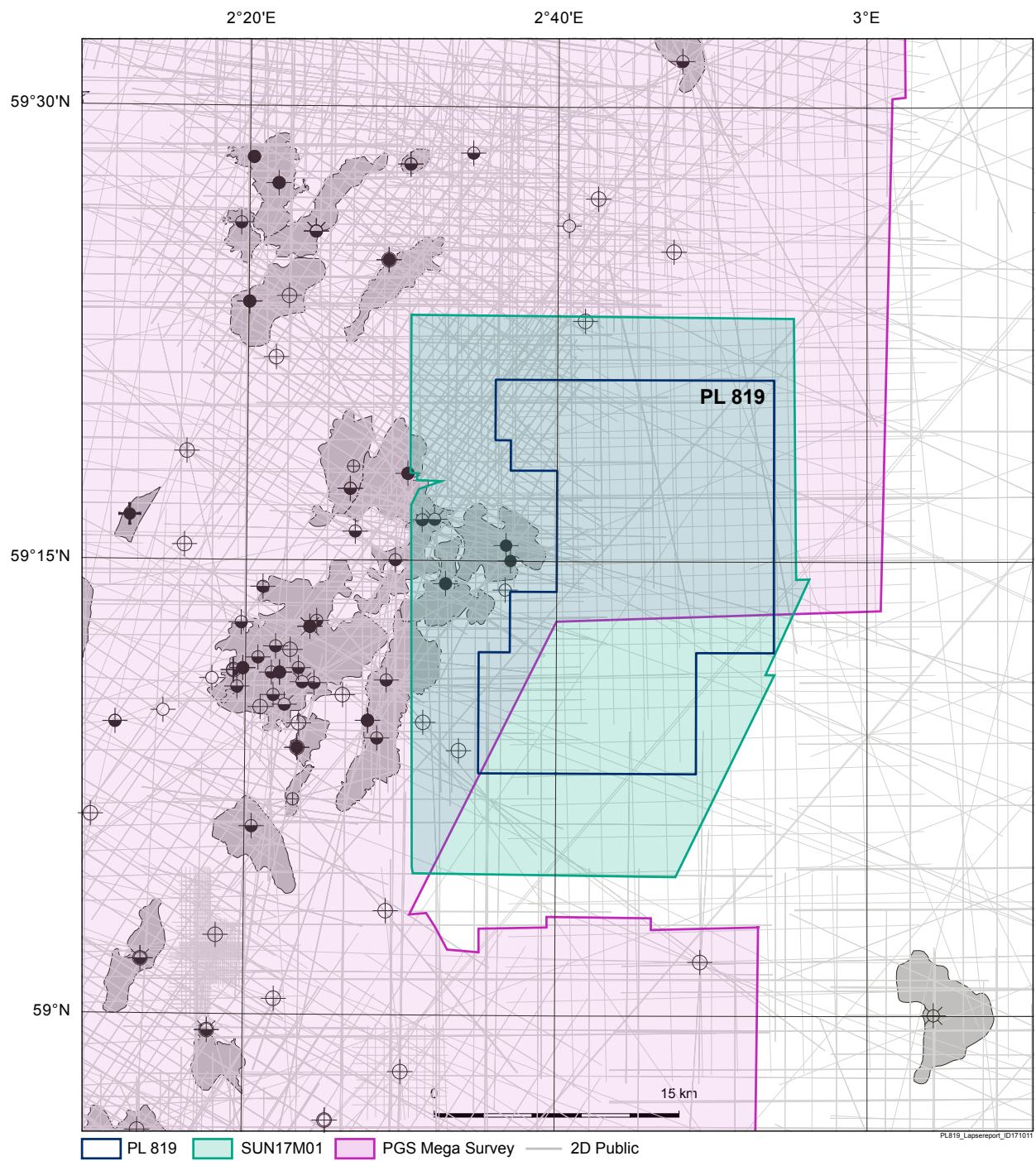


Figure 2.1 Seismic database map

2.2 Well data

The wells used in the evaluation of PL 819 is given in Table 2.2.

Table 2.2 PL 819 Common well database.

All the wells have full access to raw data.

Well	NPDID	Well	NPDID	Well	NPDID
25/4-1	359	25/8-8 S	2612	25/10-7 S	2769
25/5-1	884	25/8-9	2988	25/10-8	2955
25/5-2	1346	25/8-11	3209	25/10-8 A	3098
25/5-3	1488	25/8-12 A	3772	25/10-10	6345
25/5-4	1691	25/8-12 S	3771	25/11-1	143
25/6-1	524	25/8-13	4438	25/11-5	366
25/6-2	1949	25/8-16 S	6082	25/11-9	213
25/6-3	3885	25/8-18 S	7388	25/11-15	1872
25/7-1 S	898	25/9-1	2476	25/11-16	1920
25/7-2	1494	25/9-2 S	4735	25/11-17	1921
25/7-5	3132	25/9-4	7299	25/11-19 S	2562
25/8-1	173	25/10-1 R	512	25/11-21 S	2701
25/8-2	363	25/10-2 R	511	25/11-24	5470
25/8-4	363	25/10-4	217	25/11-27	7179
25/8-5 S	2390	25/10-4 R	510	25/12-1	374
25/8-7	2612	25/10-6 S	2728		

3 Results from geological and geophysical studies

Several studies are performed to evaluate the prospectivity in the PL 819 licence.

Seismic reprocessing and merge (2016-17, DUG)

- Broadband PSDM reprocessing significantly improved imaging at target level and above compared to the older, conventional processed datasets. The broadband signature and the seamless merge has improved the reflection continuity and seismic facies signatures.

Petrophysical evaluation and log conditioning (2016, DUG)

- Full petrophysical interpretation of five key wells were undertaken. The petrophysics is used in conjunction with rock physics to derive a series of rock property trends for a variety of lithology types. Synthetic curves were generated where elastic logs were missing.

Rock physics and stochastic forward modelling (2016, DUG)

- A comprehensive rock physics study was carried out to derive depth-dependant elastic rock property trends for various lithologies and provide a quantitative interpretation (QI) model. The study includes examination of lithology and fluid discrimination, expected interface reflectivity, AVA responses and AVA stack rotation modelling. The study focussed on the primary reservoir target, Heimdal Fm.

Sand detectability modelling and 2D inversion test (2017, DUG)

- Synthetic modelling was performed to evaluate the detectability of the Heimdal Fm reservoir sandstones. Variability of fluid substitution, thickness, saturation and net-to-gross were modelled. The study concluded that it should be possible to detect Heimdal Fm sandstone of more than 5 meters thicknesses if located within the Lista shale. Oil and brine filled reservoir could be possible to separate on seismic, but is more challenging than lithology (shale-sand). A 2D inversion test was run to investigate the potential of inversion based on real seismic. It resulted in good match between wells and inversion, both with respect to lithology and fluid.

Integrated stratigraphic and depositional model study for Paleocene and Oligocene (Skolithos, 2017)

- A consistent stratigraphic and depositional framework of the Paleogene succession was established in order to investigate the eastwards extension of the Paleocene Heimdal Fm sandstone into the PL819 area. Results indicate that the Heimdal Fm sandstones can be expected over the PL 819 licence with some confidence. These sandstones are anticipated to comprise sheet-like heterolithic of a terminal lobe with a finer grain size and lower reservoir quality than the fairway axis sands typical of the producing fields in the area.

2D structural reconstruction (Badleys, 2016)

- Sequential backstripping and forward modelling of three key sections across the Utsira High were undertaken. The main objective was to investigate the regional tilting during deposition of the Paleogene sequences to evaluate the possibility of Paleocene sandstones in the licence area. The study was discarded in the prospect evaluation due to lack of reliable results.

Seismic reprocessing and merge were key to the evaluation as the broadband signature and seamless merge significantly increased the confidence of the seismic interpretation. The geophysical studies performed has increased our understanding of the expected seismic response of the Heimdal Fm sandstone. In addition, there is very good match between modelled response in wells and observed response on actual seismic.

After completion of the semi-regional stratigraphic and sedimentological study, the geological understanding of the depositional facies distribution improved. The proposed chronostratigraphic scheme is consistent, reliable and of a scale suitable for seismic interpretation.

4 Prospect update report

The main lead in the APA 2015 application was the Paleocene Pleiadene lead with a possible southwards extension (Merope) and an Eocene lead located to the north (Gemini). After the new evaluation only Pleiadene lead remains, but the outline has shifted eastwards compared to the original position. Figure 4.1 shows the outlines of the original leads from APA 2015 compared with the new outline of the Pleiadene lead.

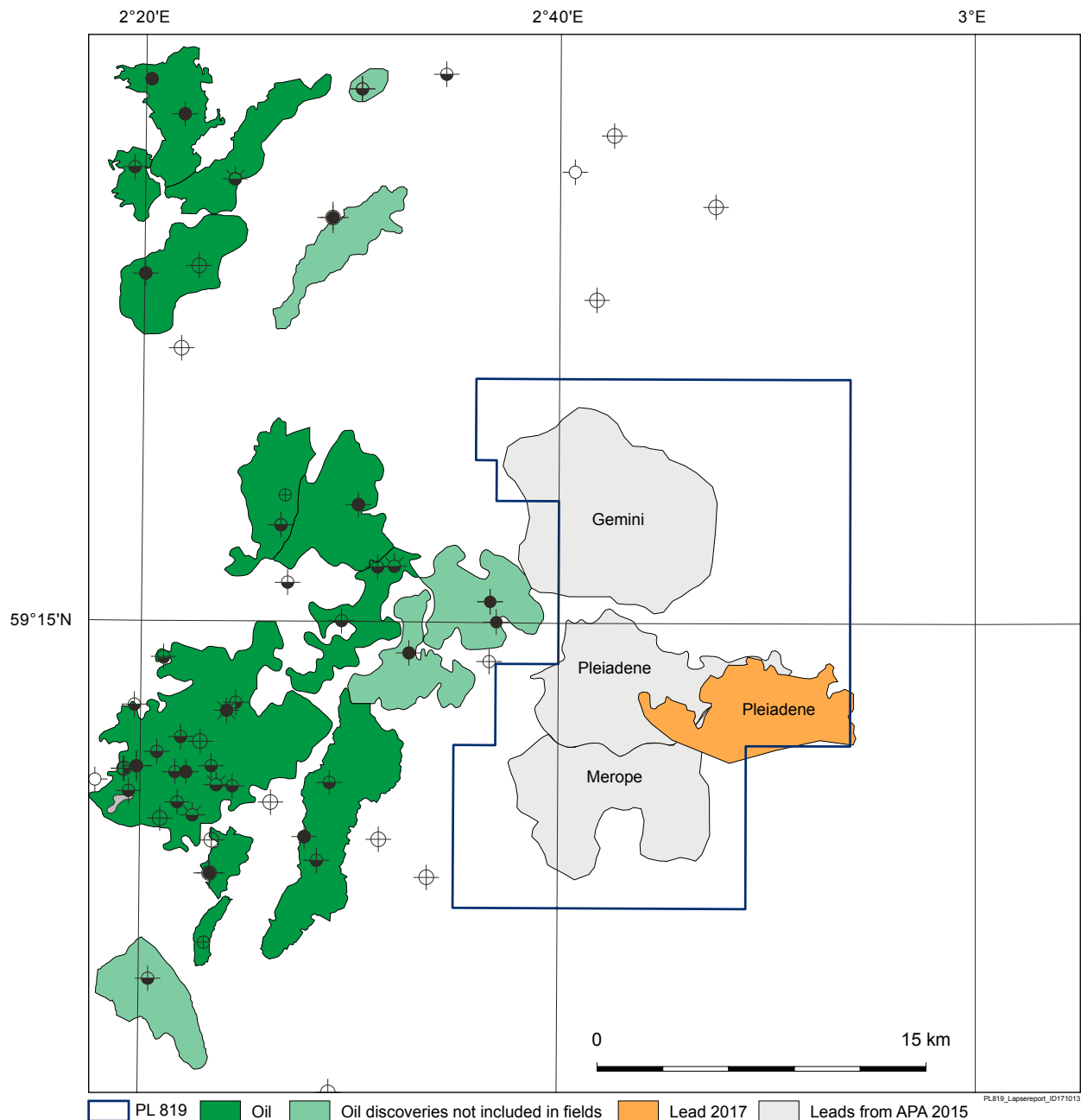


Figure 4.1 Original and new prospectivity in PL 819

Original lead outlines from APA 2015 and updated Pleiadene lead outline based on evaluation during licence period.

Pleiadene lead

The Pleiadene lead is re-interpreted based on the reprocessed seismic SUN17M01. The trap is a conceptual stratigraphic trap due to lack of seismic pinch-out towards east on 3D seismic. The stratigraphic and depositional model study (Skolithos, 2017) suggests that the Heimdal Fm reservoir is part of the T30 sequence (Figure 4.2), deposited in a deep-water fan system sourced from the Shetland Platform to the west and extended to the east of the South Viking Graben during the late Paleocene (Figure 4.3). The seismic inversion test by DUG confirms that the reservoir presence is likely (Figure 4.4), but its distribution and quality remain uncertain. It is not possible to differentiate between moderate (fairway margin) and poor (fairway fringe) reservoir facies.

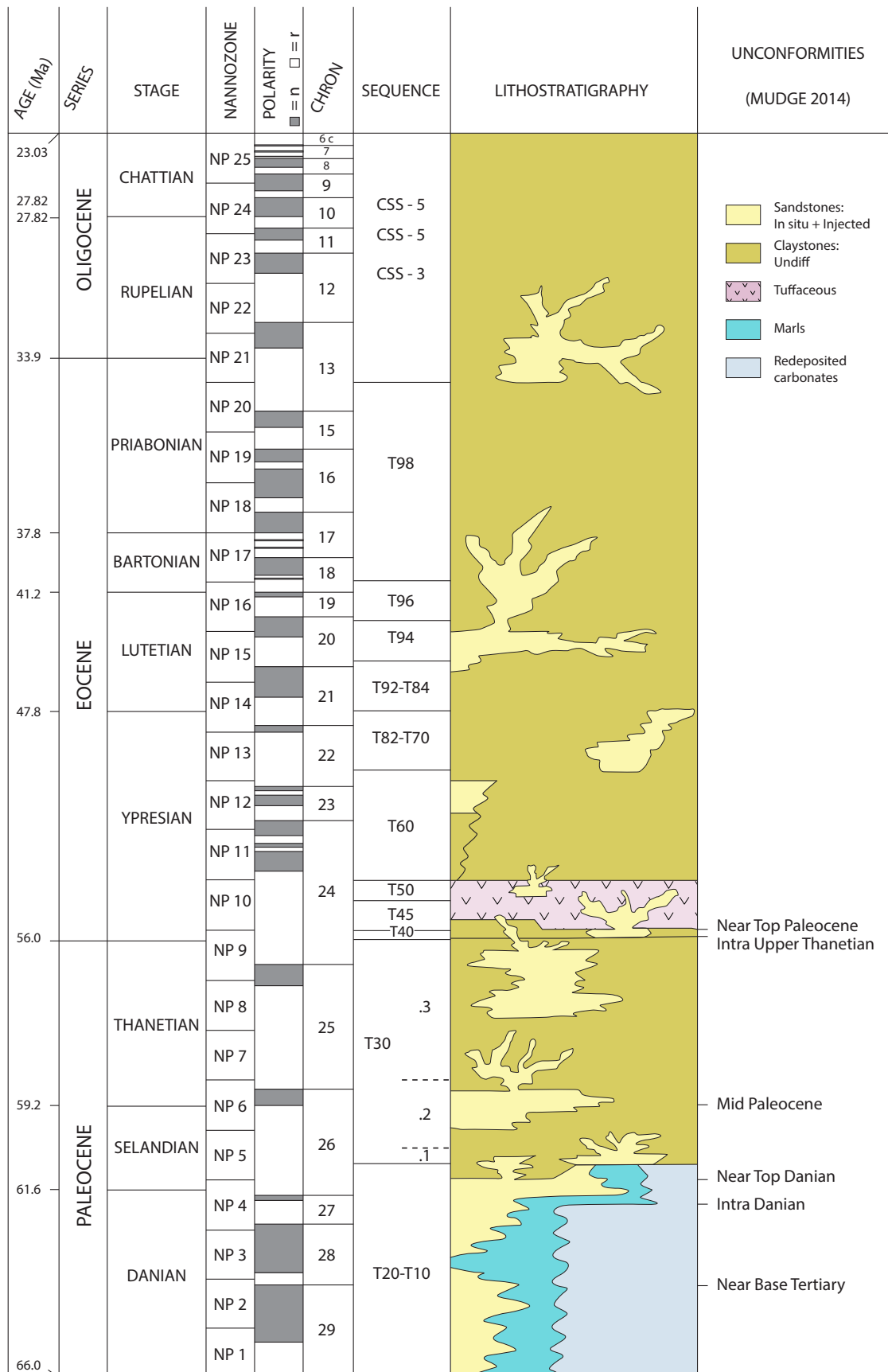


Figure 4.2 Chronostratigraphic scheme
Stratigraphic summary of Paleocene to Oligocene strata, Norwegian North Sea Q25.

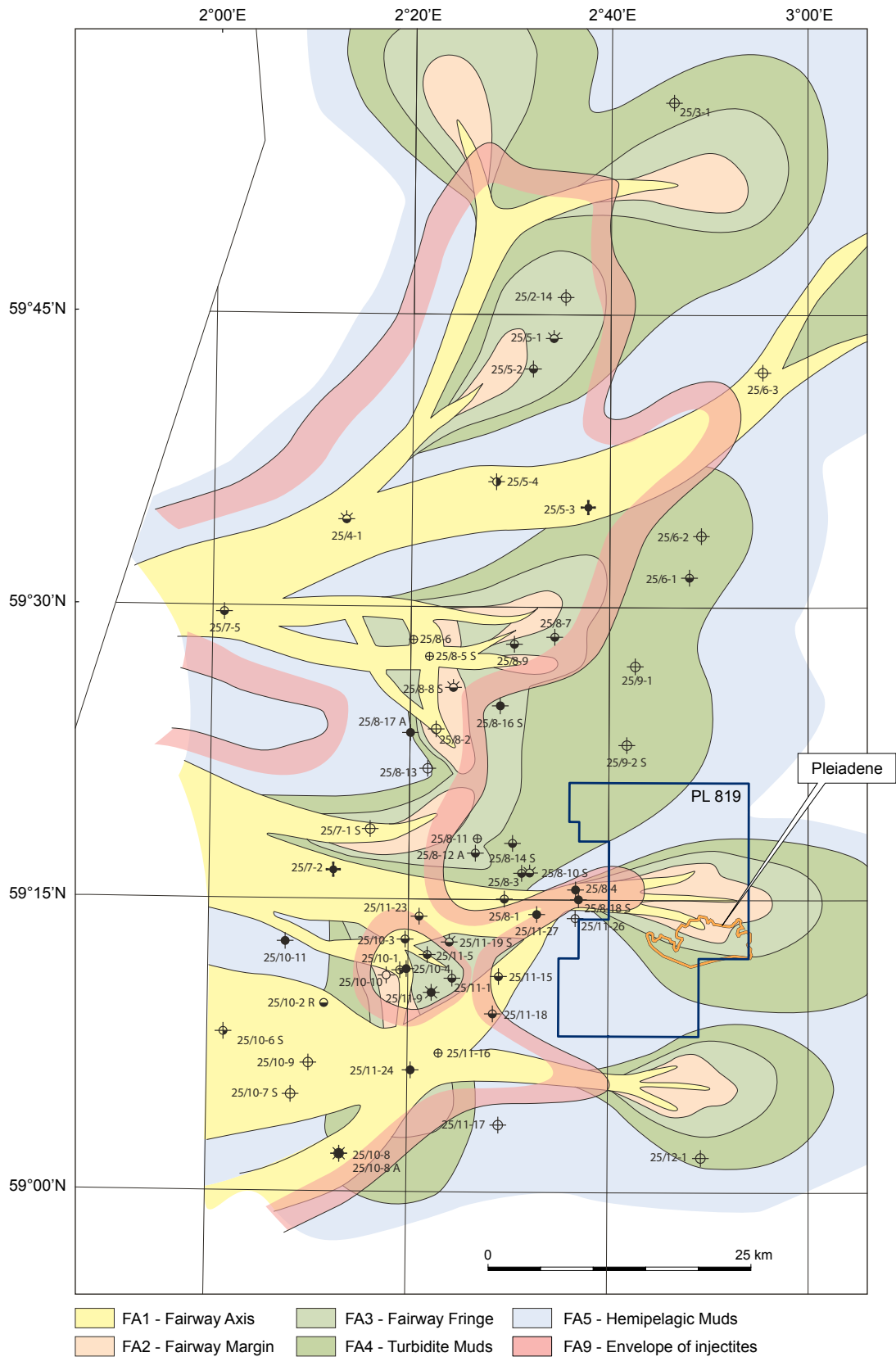


Figure 4.3 Composite GDE map of the T30 sequence (Lista-Hermod sequence)

The map shows that the deepwater turbidite fan systems built out further east during the late Selandian to early Thanetian. T30 sequence is represented by 3 sub-sequences in the area proximal to PL 819; FA2 (Por ~ 26%, Perm<200mD), FA3 (Por 22%, <10mD) and FA4 (non reservoir).

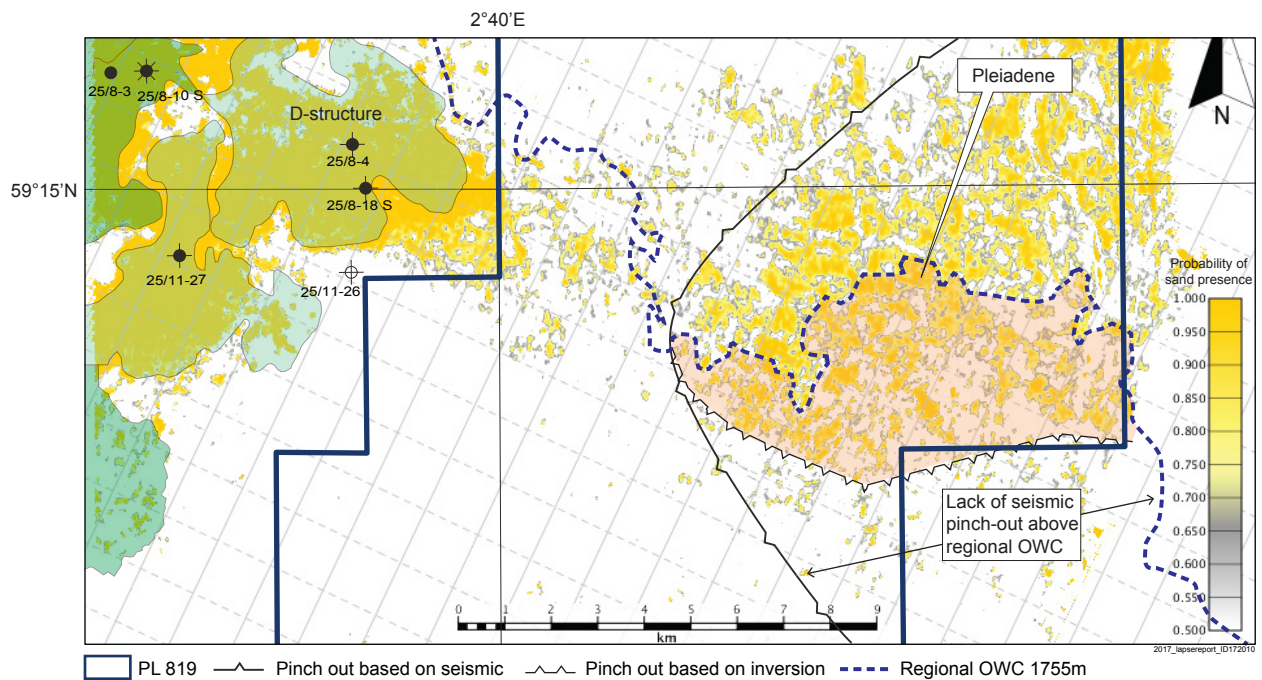


Figure 4.4 Pleiadene trap definition
Elements defining the conceptual trap.

The Pleiadene lead outline is based on several elements (Figure 4.4). Towards north, the trap is restricted by the regional OWC at 1755 mTVDSS. The southern limit of the outline is set where the inversion test indicates the sands pinch out. The trap is conceptual since the pinch-out is not mappable on seismic towards east. The critical area is where the reservoir reflections sits above the regional OWC south-east of the lead outline. The pinch-out might exist east of the 3D seismic coverage, but has not been observed on public 2D seismic data.

Seismic well ties show a very good match to the reprocessed seismic, SUN17M01. A characteristic peak-trough signal above Top Shetland Gp is observed where Heimdal Fm reservoir is present. Lack of reflectivity where Heimdal Fm reservoir is absent was also modelled and observed in well 25/11-26. East of the discoveries there is an area without reflectivity (interpreted to be mainly shale deposits), while further east, a very weak peak is observed on seismic between Intra Balder Fm (T45) and Top Shetland Gp. On the inversion test, the most likely lithology associated with this reflection is sandstone (Figure 4.5). This forms the basis for interpreting near top and base reservoir for the Pleiadene lead.

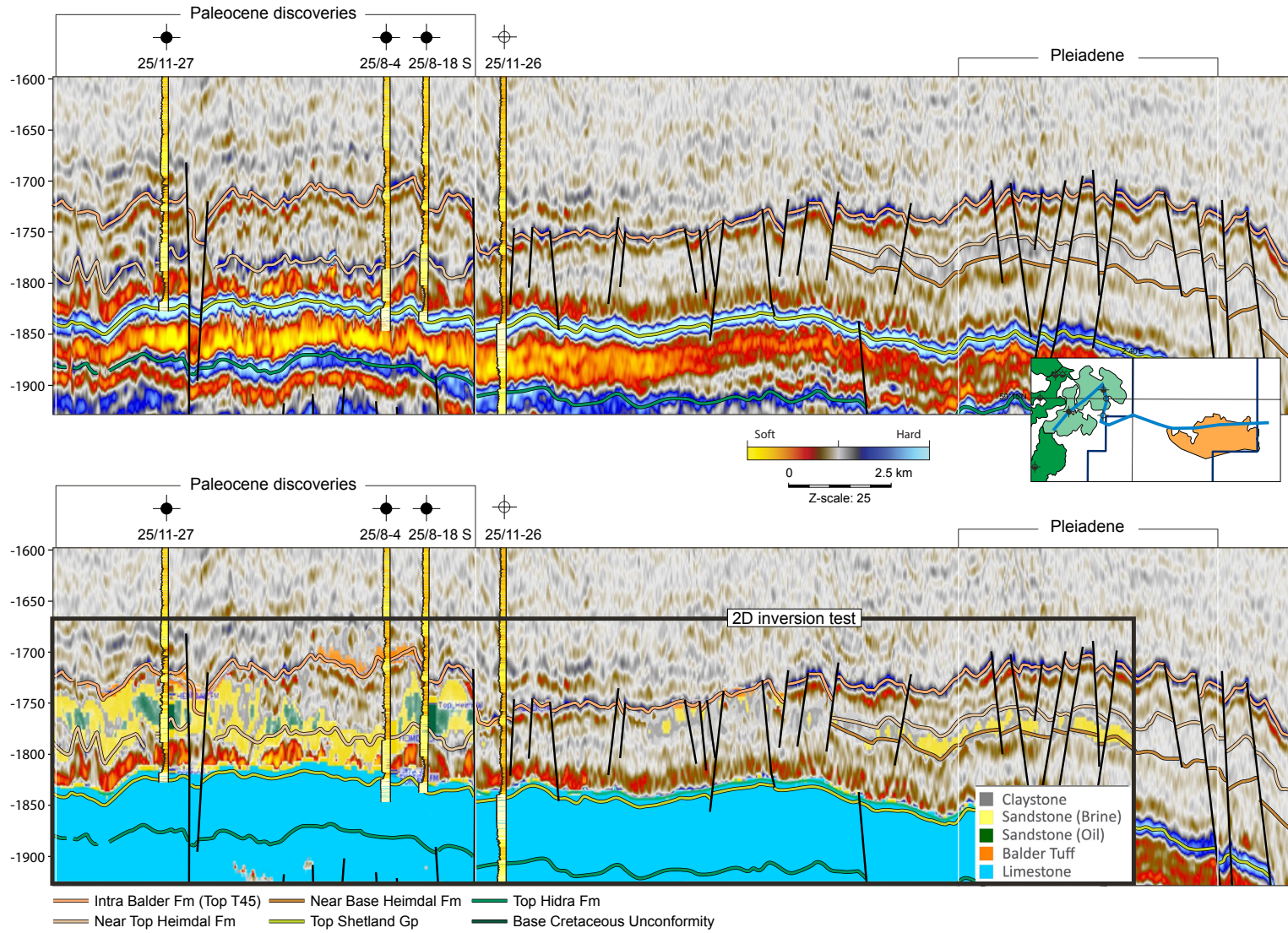


Figure 4.5 Seismic west-east profile

Seismic profile illustrating the characteristic seismic signal observed in the Paleocene discoveries compared to the much weaker signal over Pleiadene.

Figure 4.6 shows a seismic profile from south-west to north-east. This line illustrate how the possible reservoir reflections onlap the structural high towards south-west. Seismic pinch-out is mappable on seismic in both directions. Note that the seismic reflections defining top and base reservoir continues further south-west than the lead outline. The southern limit of the lead outline is based on the pinch-out of sandstone interpreted from the inversion test.

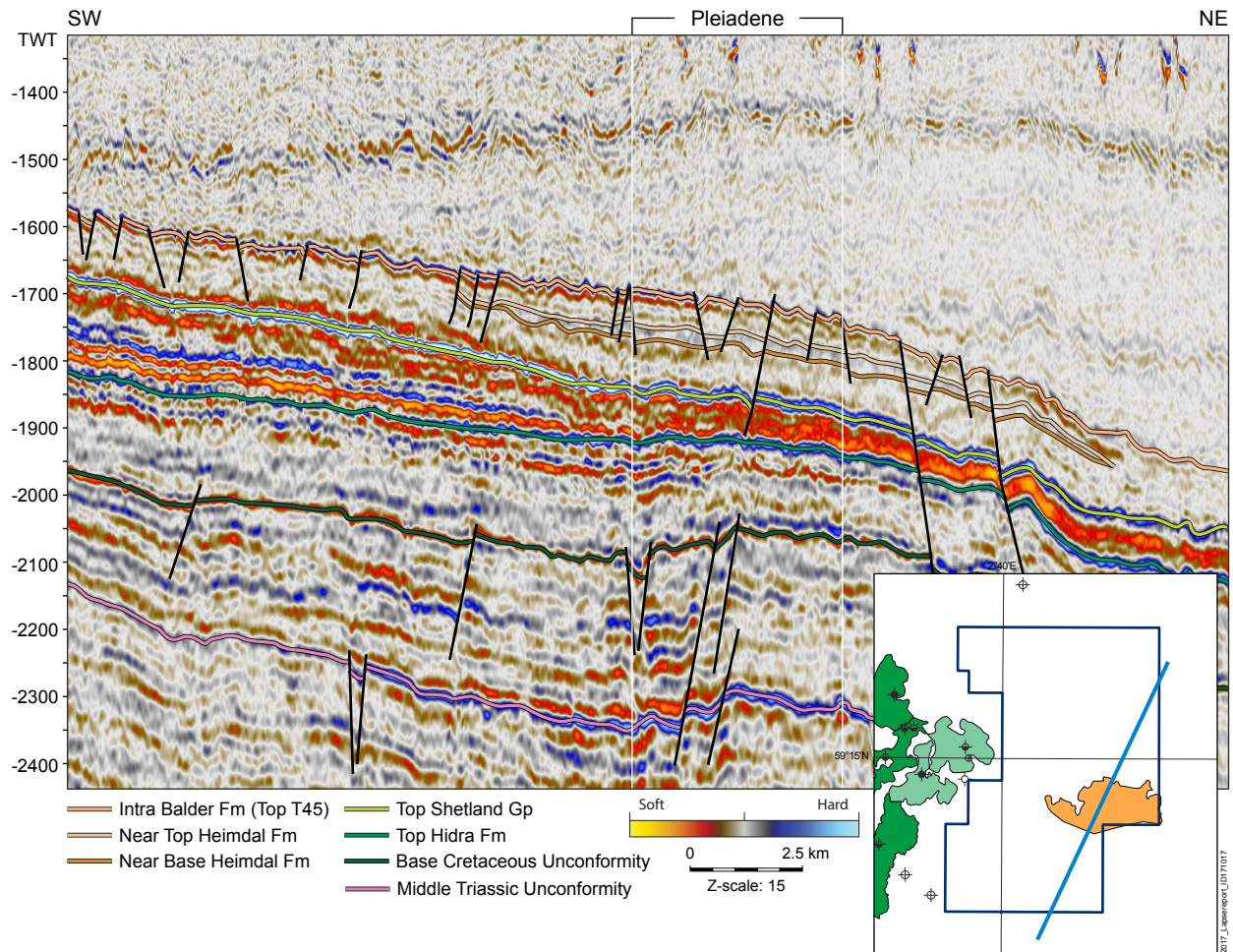


Figure 4.6 Seismic profile from south-west to north-east

Pleiadene is a conceptual stratigraphic trap which onlaps the structural high towards south. Seismic reflections continues further south than the lead outline. The southern limit of the lead outline is based on the pinch-out of sandstone interpreted from the inversion test.

Lack of trap definition on seismic towards south-east is the critical risk (Figure 4.7). The thickness between the mappable reflections increases towards east, and no sign of pinch-out has been observed in this direction. Also, the isochore between the two well defined reflections Intra Balder (T45) and Top Shetland Gp increases. This indicates that the seismic reflections interpreted are not related to sandstone coming from the west, but is part of the gradually filling of the Stord basin. However, sand lobes coming from west (T30) could also be present over the lead area, but is not mappable on current seismic.

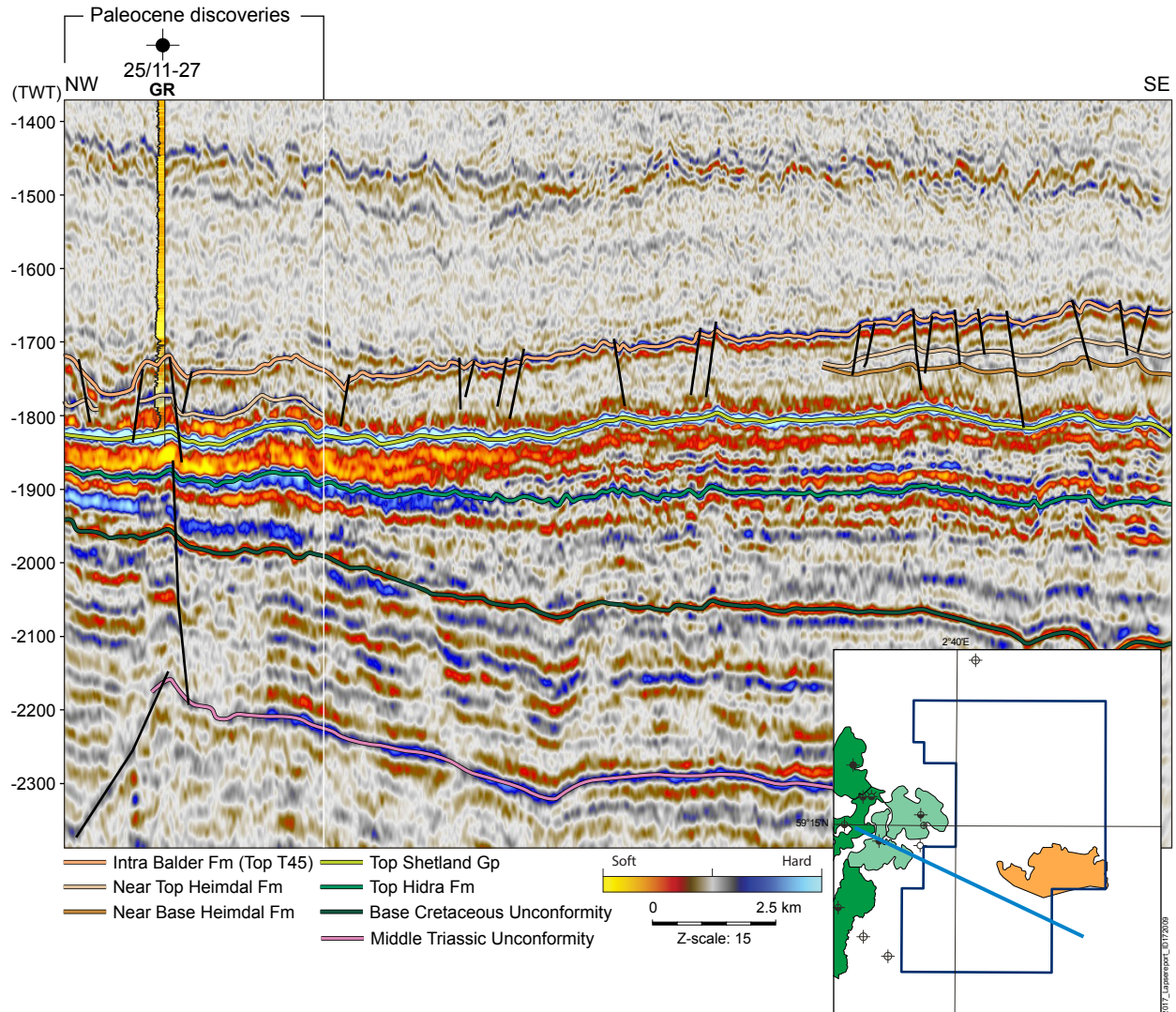


Figure 4.7 Trap on Pleiadene is not defined on seismic

There is no pinch-out of seismic reflections towards east on the 3D seismic. The critical area for the trap is towards south-east where the reflections sits above the regional OWC. The pinch-out might exist east of the 3D seismic coverage, but has not been observed on 2D data.

Figure 4.8 shows the top reservoir depth map (Near Top Heimdal Fm). The map is based on seismic interpretation in areas where a seismic event exists. In areas without reflection near Top Heimdal Fm, a calculated surface is generated based on the isochrone between Intra Balder (T45) and Top Shetland.

The geological understanding suggests that the reservoir quality appears to be controlled by grain size and clay content linked to gross depositional environment. The expected sandstone facies (FA2 and FA3) in the licence area corresponds to a finer grain size and lower reservoir quality than the Heimdal Fm sandstones (FA1) found in the 25/8-4 & 18 S D-structure discovery.

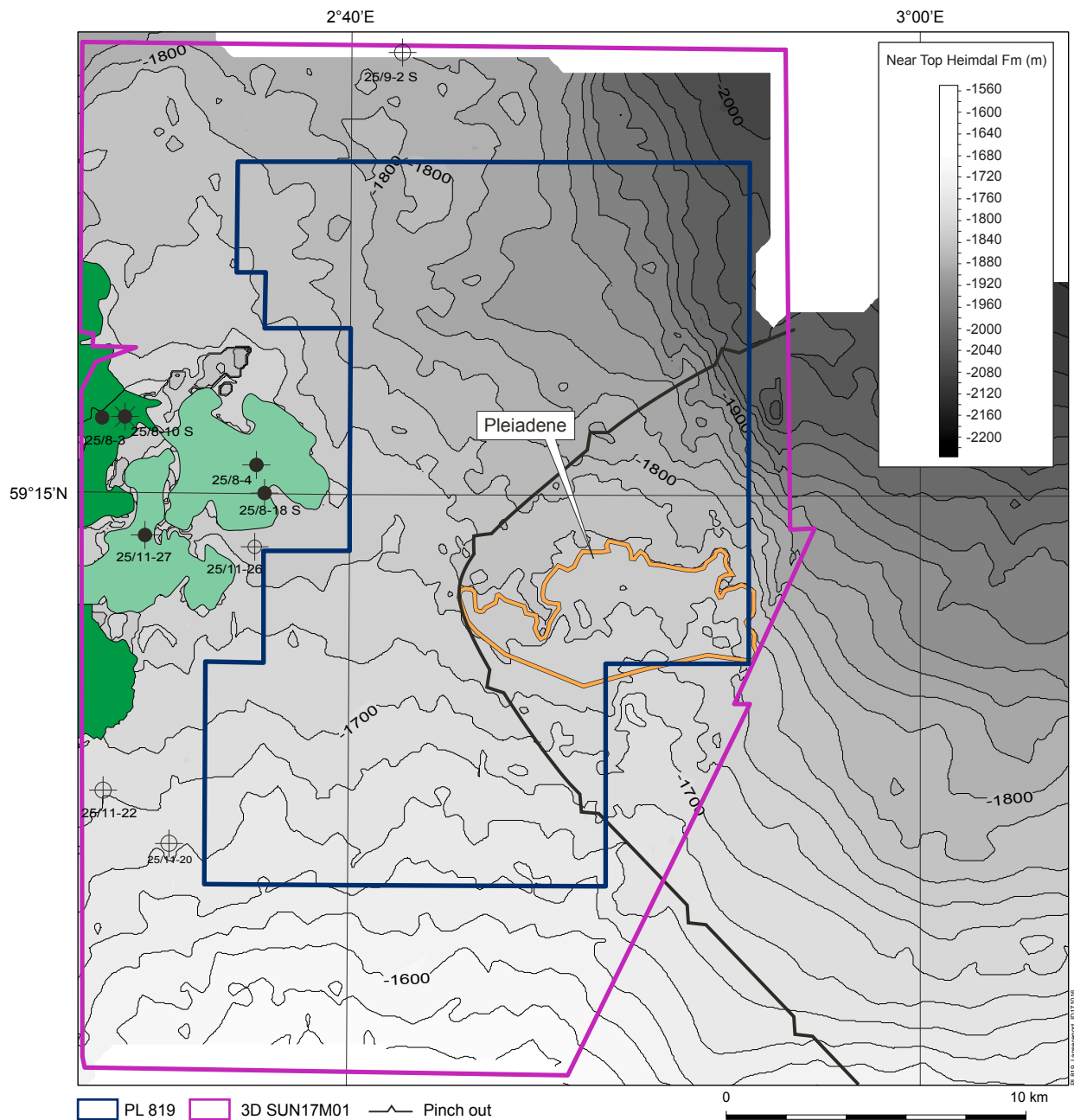


Figure 4.8 Top reservoir map.

Depth map Near Top Heimdal Fm. Based on interpreted horizons in areas with seismic signal indicating reservoir presence. In the areas without mappable reflections it is calculated based on Intra Balder Fm (T45) and Top Shetland Gp interpretation. East of the 3D survey, the interpretation is based on public 2D seismic.

5 Technical evaluation

Due to lack of trap definition, no volume and hence no economical evaluation is performed for the Pleiadene lead.

6 Conclusions

The Pleiadene lead has been re-evaluated based on new reprocessed seismic and integrated geological and geophysical studies during the licence period.

The trap for Pleiadene is not mappable on the available seismic data and thus the trap is conceptual. The geological model suggests that reservoir sands exist over the lead area and shale out towards east.

The partnership is aligned that no more technical work can be done on the existing data to further de-risk the trap definition.

No further upside potential has been recognised in the licence.

The partnership is aligned on a negative drill decision in PL 819, hence the area is relinquished to the authorities.