

PL 1167 – Licence status report

2025-024351

Summary

PL1167 was applied for in APA 2021 by Wintershall Dea AS (APA 2021 application, reference is found on page 15) and was granted in 2022 with Equinor Energy AS as Operator. The licence included acreage within blocks 6706/6 and 6707/4 and is located 70 km north of the Aasta Hansteen field (Figure 1.1).

Two wells are drilled within and near the licence, Hvitveis (6706/6-1) and Marisko (6706/6-2 S) (Figure 1.1). A working petroleum system within producible Paleocene, Danian reservoir is proven by a few meters gas column, discovered in the Hvitveis well. The Hvitveis discovery is believed not to be commercial.

Three Danian reservoir levels are mapped out within PL1167. Amplitudes within closures are observed at all three levels and make up several prospects (Figure 1.2), which have been evaluated with regards to volume and risk. An amplitude anomaly in a shallower stratigraphy, possibly Eocene of age, has been investigated to check if it could be a secondary target for a possible well in one of the Danian prospects.

PL1167 is located within the reservoir fairway from Greenland and in a possible more proximal position compared to the Hvitveis and Marisko wells.

The geological setting in PL1167 is characterised by well-defined rotated fault blocks, progressively getting shallower towards the north. Long-term and late fault activity in the area causes trap seal to be the key risk in the licence.

3D seismic data covers the entire licence acreage as well as reference discoveries, but no drilling candidates have been identified. Several prospects have been defined, but none of them being large enough to have a positive business case.

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1 Licence history

<u>Licence:</u>	PL1167
<u>Awarded:</u>	11.03.2022
<u>Licence period:</u>	11.03.2022-11.03.2025
<u>Licence group:</u>	Equinor Energy AS 60 % (Operator) Harbour Energy Norge AS 40 %
<u>Licence area:</u>	526 km ²

Work programme:

Geological and geophysical studies to decide on optional re-processing of 3D seismic.
Drill or drop decision within 1 year from award, which was extended by 2 years while awaiting delivery of reprocessed seismic data (it was a positive decision on re-processing).
Geological and geophysical evaluation of prospects to mature drilling candidate. Work obligations are fulfilled within extended drill or drop decision deadline 11.03.2025.

Meetings held:

28.04.2022	EC/MC startup meeting
15.06.2022	EC WM
17.11.2022	EC/MC meeting
27.02.2023	EC WM
23.11.2023	EC/MC meeting
17.06.2024	EC WM
16.10.2024	EC/MC meeting
14.01.2025	EC WM

Work performed:

Post migration pre-stack conditioning of the existing EM00-01WIN17R01 survey was performed as part of the PL1167 work programme. The conditioned seismic data were studied in detail, focusing on updating all prospectivity in the licence. A technical-economic valuation screening was performed to evaluate the viability of a single prospect or a prospect cluster development.

Reason for surrender:

The partnership decided to relinquish the licence on the extended DoD date 11.03.2025. Despite many prospects with promising seismic amplitudes, neither a single prospect nor a prospect cluster has been identified that has large enough volume potential for a development solution with a positive business case.

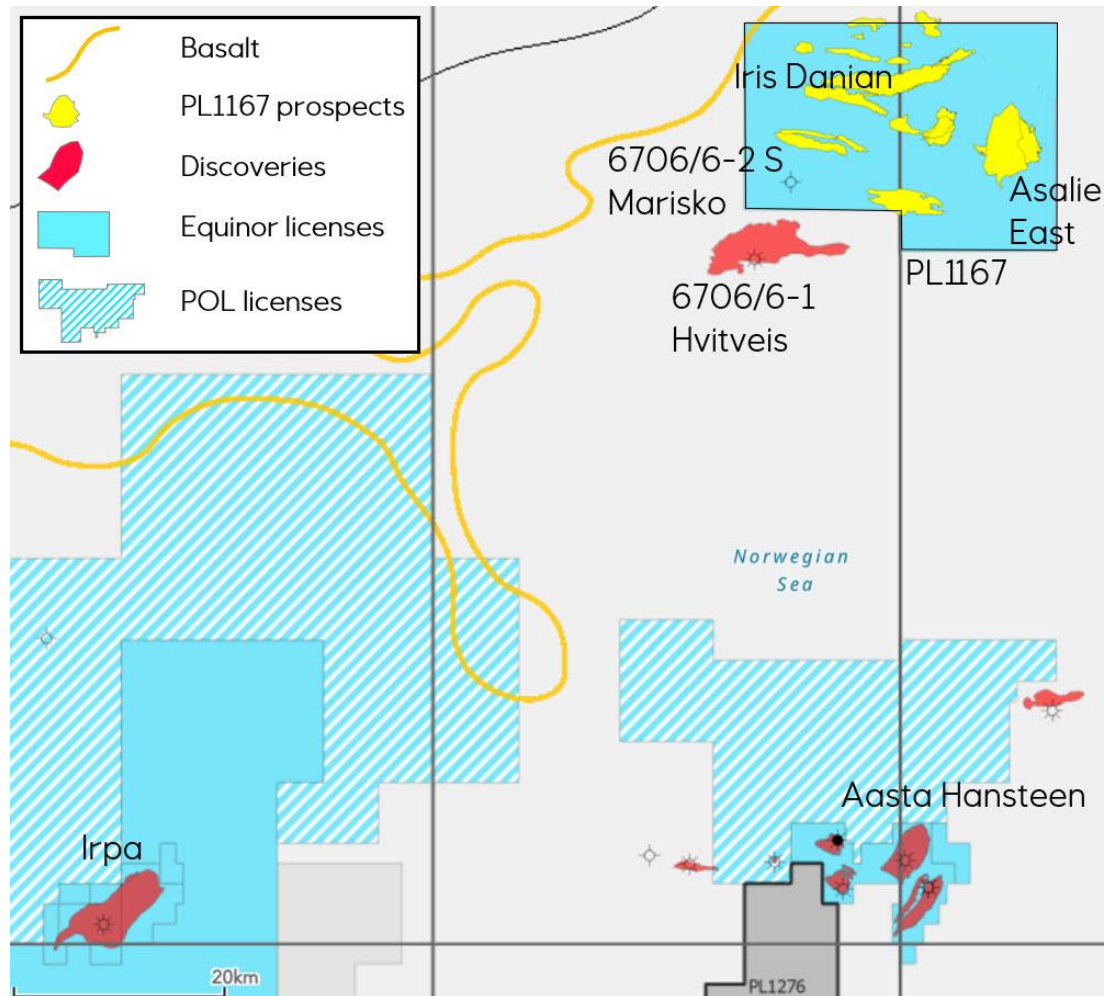


Figure 1.1 Licence map showing PL1167 and surrounding licences and discoveries. The main prospects in PL1167 are Asalie East and Iris Danian. Distance from PL1167 to Aasta Hansteen is approximately 70 km.

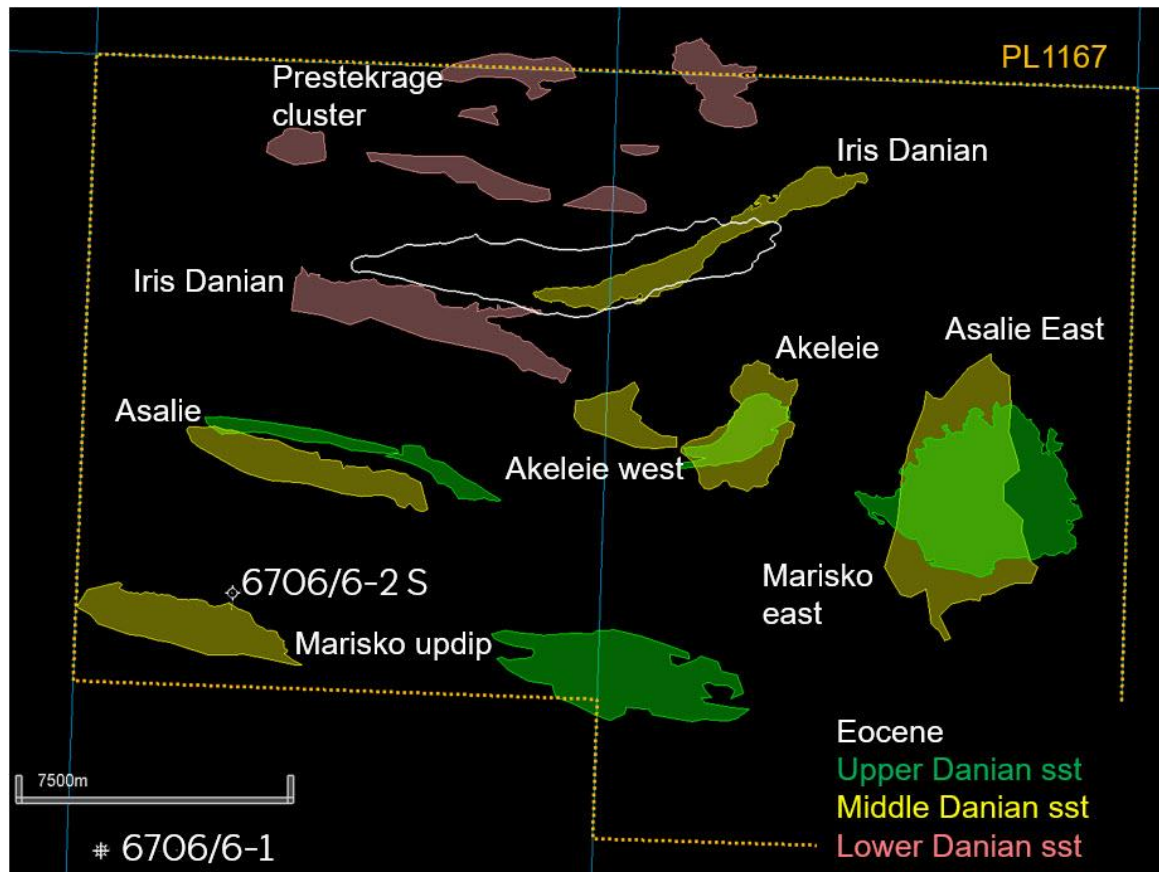


Figure 1.2 PL1167 Prospect overview. Segment outlines indicated and annotated for each reservoir unit.

2 Database overviews

2.1 Seismic data

The seismic database (Table 1) consists of released 2D data and three 3D seismic surveys (Figure 2.1).

Table 1 Overview of 2D and 3D seismic database.

Seismic survey	Operator	2D/3D	Year	Comment
EM00-01WIN17R01	Wintershall AS	3D	2017	Re-processing of EM00-01
EM00-01EQR23A	Equinor Energy AS	3D	2023	Pre-conditioning of EM00-01WIN17R01 (By DUG)
EM00-01EQR23B	Equinor Energy AS	3D	2023	Pre-conditioning of EM00-01WIN17R01 (By Sharp reflection)
Alle relevant and released 2D seismic		2D		Full fold, for tie to wells

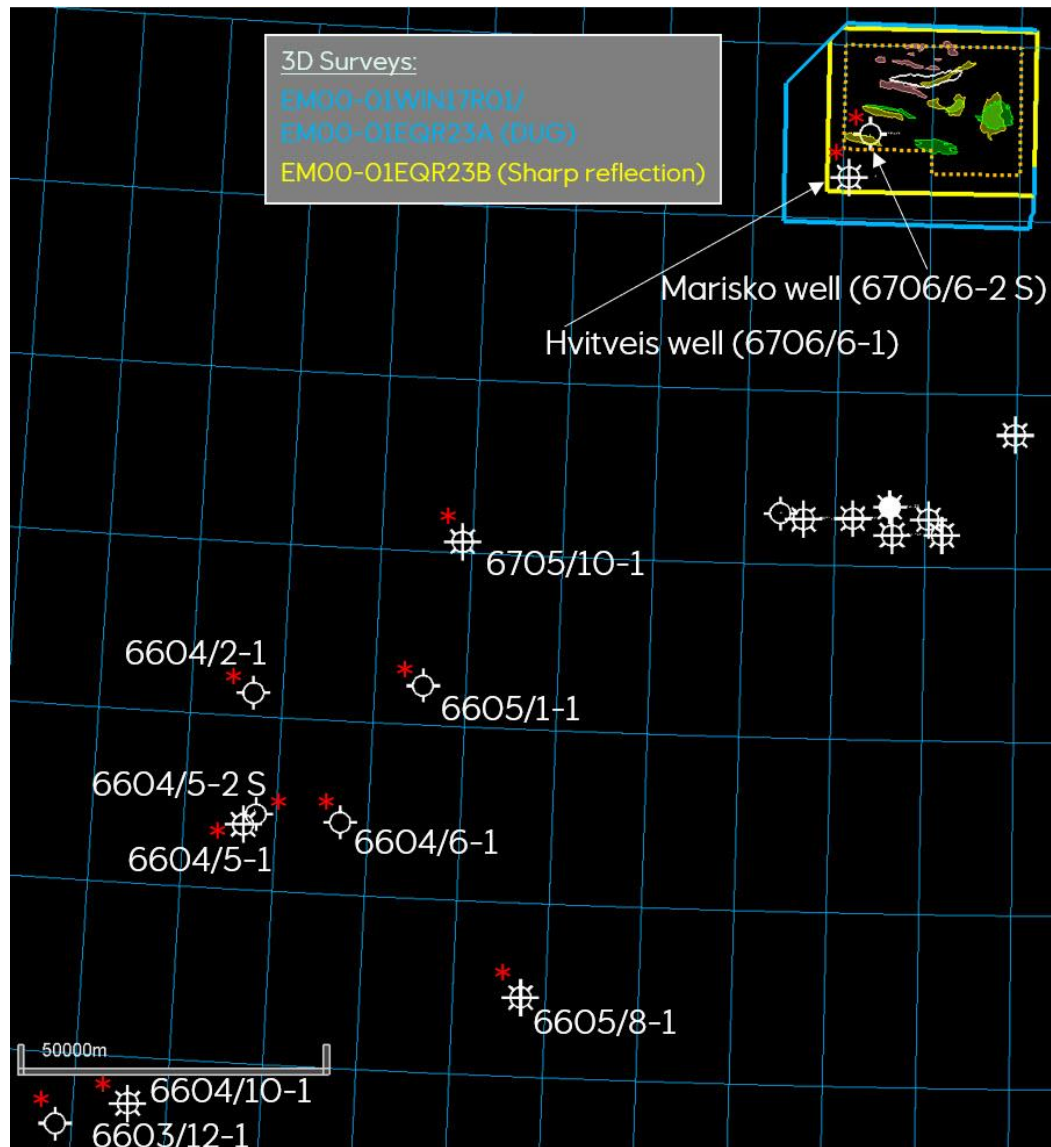


Figure 2.1 Map view of 3D seismic surveys for PL1167. Key wells are marked with a red star (Table 2).

2.2 Well data

The common well database consists of released exploration wells in the Vøring basin. Key wells for the prospect evaluation, which are proving the working play model including reservoirs, source and migration, are marked with a red star in Figure 2.1 and are listed in Table 2.

Table 2 Overview of key well database. In addition, all released wells in the Vøring Basin are part of PL1167 common database.

Well	Year	Operator	Well name	Status	Age at TD
6603/12-1	2009	AS Norske Shell	Gro-1	Gas	Late Cret. (Springar Fm.)
6604/10-1	2010	AS Norske Shell	Gro-2	Gas	Late Cret. (Springar Fm.)
6604/2-1	2011	BG Norge AS	Gullris	Dry	Late Cret. (Springar Fm.)
6604/5-1	2018	Wintershall AS	Balderbrå	Gas	Late Cret. (Springar Fm.)
6604/5-2 S	2020	Wintershall AS	Balderbrå	Dry	Late Cret.
6604/6-1	2020	Wintershall AS	Gullstjerne	Dry	Late Cret.
6605/1-1	2009	Statoil Hydro AS	Obelix	Gas	Late Cret. (Nise Fm.)
6605/8-1	2005	Norsk Hydro AS	Stetind 1	Gas	Early Cret. (Lange Fm.)
6705/10-1	2009	Statoil Hydro AS	Asterix	Gas	Early Cret. (Lange Fm.)
6706/6-1	2003	Esso EP AS	Hvitveis	Gas	Paleocene
6706/6-2 S	2019	Wintershall AS	Marisko	Dry	Late Cret.

3 Results of geological and geophysical studies

The understanding of the prospectivity in PL1167 is briefly summarized in the section below.

Source and migration

Several Cretaceous rocks have shown to have source rock potential in the Vøring basin area.

Reservoir quality

The main reservoirs in PL1167 consist of deepwater turbidite channel and lobe deposits, distributed on three separate sandstone levels of Paleocene Danian age (here called Danian upper, middle and lower sst.). Functioning Paleocene, Danian (Tang Fm.) reservoir is proven in the two wells drilled in the area, Hvitveis (6706/6-1) and Marisko (6706/6-2 S). It is believed that the mapped PL1167 prospects are located in a more proximal position than the Hvitveis and Marisko wells. The prospects are also shallower buried towards north, and better reservoir quality is expected in the mapped prospects, compared to the two wells.

Trap and seal

The main prospectivity is related to rotated fault blocks. However, the main prospect (Asalie East) is a four-way dip closure. Thickening of reservoir sections towards the faults indicates syn-deposition and long-term fault activity. Large fault systems are observed to extend all the way up to seabed, which in addition proves late fault activity. Trap seal is therefore the key risk in the area. The general observation of faults extending to seabed adds a considerable risk to the trap seal.

Geophysical studies

AVO workflows were performed on the re-processed seismic survey EM00-01EQR23A. This dataset is a post-migration, pre-stack conditioning of the EM00-01WIN17R01, which was done by PL1167 in 2023. The re-processed seismic shows some improvement in data quality such as the attenuation of

residual multiples and the level of noise. All evaluated prospects in PL1167 have been analysed and calibrated with regards to observed amplitude shut-offs. Amplitudes are compared to the two wells drilled in the area. AVO studies give geophysical support for several hydrocarbon accumulations amongst the evaluated prospects, some with depth- or partly depth conformance. Analyses of amplitude shut-offs and spill points show that many of the accumulations are underfilled, which is aligned with the observed key risk of leakage through faults. The two largest prospects in the licence, Asalie East Danian upper sst. and Iris Danian lower sst. are both examples of presumed underfilling.

4 Prospect update report

The prospects in PL1167 have been re-evaluated with regards to volume and risk. The three segments Asalie East Danian upper sst., Iris Danian middle sst. and Iris Danian lower sst. ended up with the largest volumes (Table 3). These three segments are input for the valuation screening done. Overall, all the prospects in PL1167 have too low volume potential and relatively low geological probabilities (Pg).

The main prospect in the licence is the Asalie East prospect. Two Danian levels are mapped out and the prospect consists of two segments. However, the lower segment is not part of the valuation screening because volumes are too low.

Table 3 Overview of resource potential of the three prospect segments, included in the valuation screening: Asalie East Danian upper sst., Iris Danian middle sst. and Iris Danian lower sst.

Prospect	Segment/ Lithostrat	Depth at apex [m TVD MSL]	HC phase	In place, oil [MSm ³ OE]			Recoverable oil [MSm ³ OE]			Pg [%]
				P90	Mean	P10	P90	Mean	P10	
Asalie E	Danian upper sst	3040	Gas	10.7	17.4	23.8	4.94	8.15	11.5	28
Iris	Danian middle sst	2450	Gas	1.12	2.44	4.00	0.53	1.19	1.97	33
Iris	Danian lower sst	2875	Gas	2.82	6.91	11.8	1.61	3.99	6.85	16

Asalie East Danian upper sst.:

The Asalie East Danian upper segment is a four-way dip closure (Figure 4.1), located east of the main rotated fault block system (Figure 1.2). It is a single-cycle sand, pinching out to the north (Figure 4.2) and it is well defined on all off-set seismic cubes. The AVO fluid cube shows a depth conformant strong brightening, with a shut-off at 3200 m, indicating that the structure is underfilled. The structure has a high degree of internal faulting. Paleocene shales form a good top seal (Figure 4.2Error! Reference source not found.).

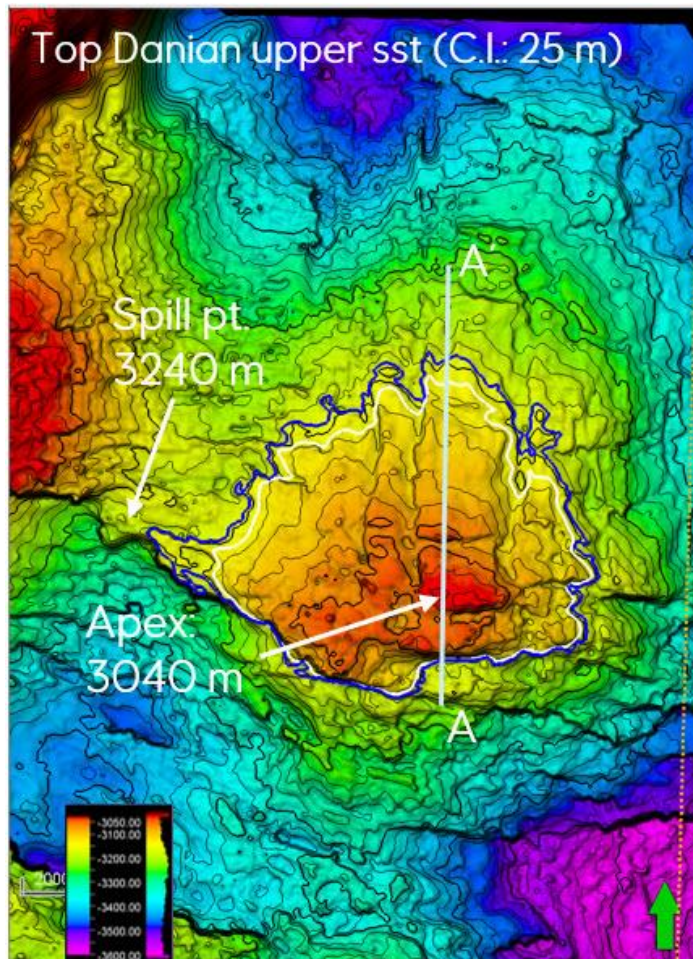


Figure 4.1 Structural depth map of the four-way dip closure, Asalie East Danian upper sst. Apex is mapped at 3040 m and spill point is mapped at 3240 m. The A-A' line refers to **Figure 4.2**.

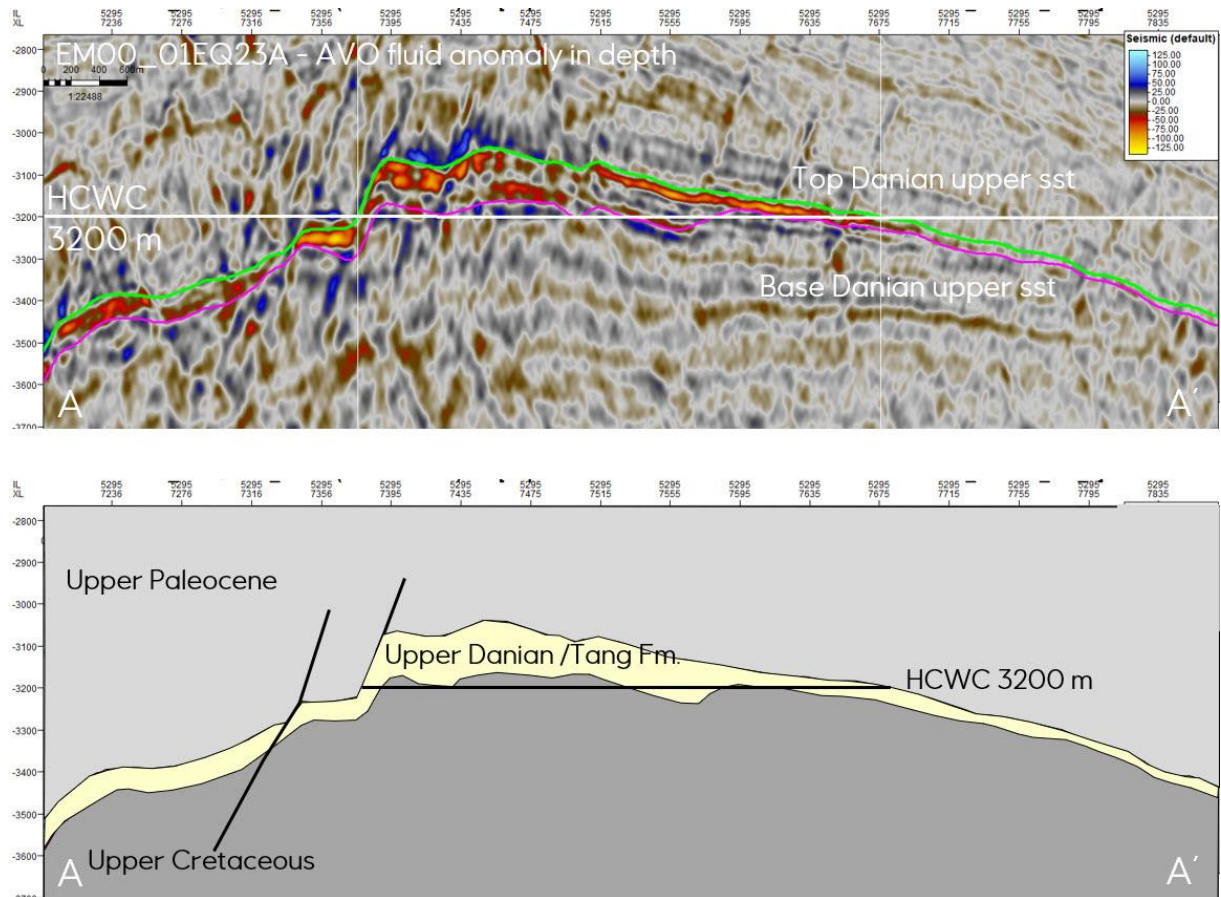


Figure 4.2 Above: North-south seismic section across Asalie East prospect. Depth semi depth-conformant shut-off at 3200 m. Reservoir is thinning towards north. Below: Geo-section of the seismic line, showing upper Paleocene shales as top seal. For location of the line, see Figure 4.1.

Iris Danian:

The second largest prospect is the Iris Danian lower sst., which is a 3-way dip closure, located two fault blocks north of the Marisko well (Figure 1.2). The prospect is well defined on the off-set seismic cubes and shows an amplitude shut-off at 2815 m (Figure 4.3). Amplitude anomalies in the overburden of Iris Danian have been investigated as a secondary target in a possible well on Iris Danian. However, high risk has been the main reason not to pursue the shallower prospect any further.

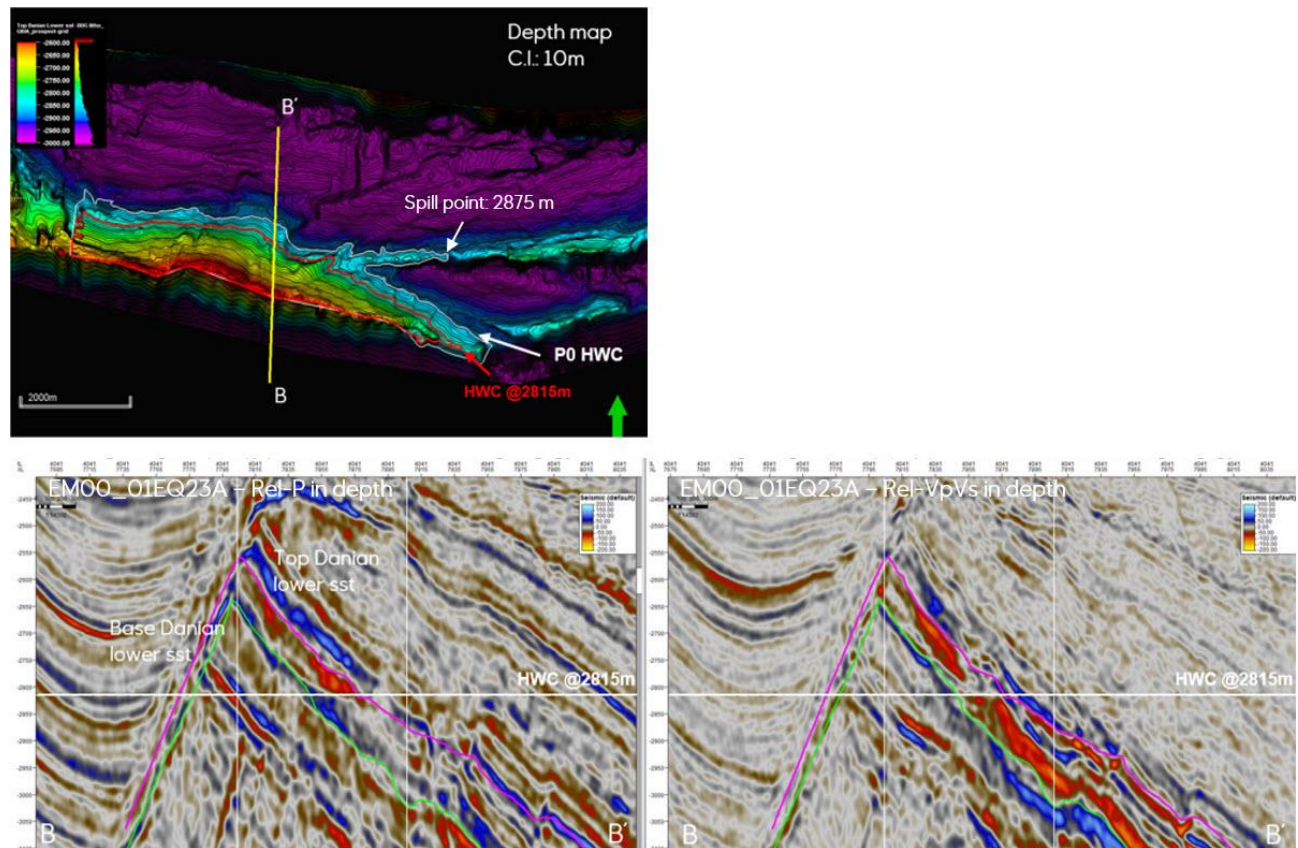


Figure 4.3 Above: Structural depth map of the Iris Danian lower sst prospect. The structure is fault bounded to the south. Structural spill point is mapped at 2875 m. Below: North-south seismic section through Iris Danian lower sst prospect, showing amplitude shut-off at 2815 m on Rel-P cube (lower left) and on VpVs cube (lower right).

5 Technical evaluation

PL1167 is located approximately 70 km north of existing infrastructure at the Aasta Hansteen gas field. The water depth in this area is up to 1300 m, very similar to that of Aasta Hansteen. Potential development solutions require installation of a temperature insulating pipeline.

Overall, most of the prospects in the PL1167 have both low volume potential and relatively low geological probabilities. One prospect (Asalie East Danian upper sst.) stands out with higher volumes (Table 3). A technical-economic valuation screening was done based on the prospects Asalie East Danian upper sst. and Iris Danian middle and lower sst., with a tie-in solution to the Aasta Hansteen field. The valuation screening concluded that much larger volumes, than the largest evaluated prospect yields (Asalie East Danian upper sst.), are required to result in robust economic scenarios. A clustering solution is challenging because of the large distances between the prospects and because of the low initial geological probabilities and low interdependencies between the prospects, which results in very high commercial risk to the combined clustered business case.

6 Conclusion

The licence partnership has unanimously decided to surrender the licence at the drill or drop decision deadline on 11.03.2025 as no economic viable drilling candidate was identified, despite the intense geophysical and geological work that was performed in this licence.

References

Wintershall Dea (2021). Application Part of blocks 6706/6 and 6707/4 - APA2021, Norwegian continental shelf.

Appendices

1. Shapefile: Asalie East Danian upper sst. prospect
2. NPD Table 5 Prospect data status-report-surrender – Asalie East Danian upper sst