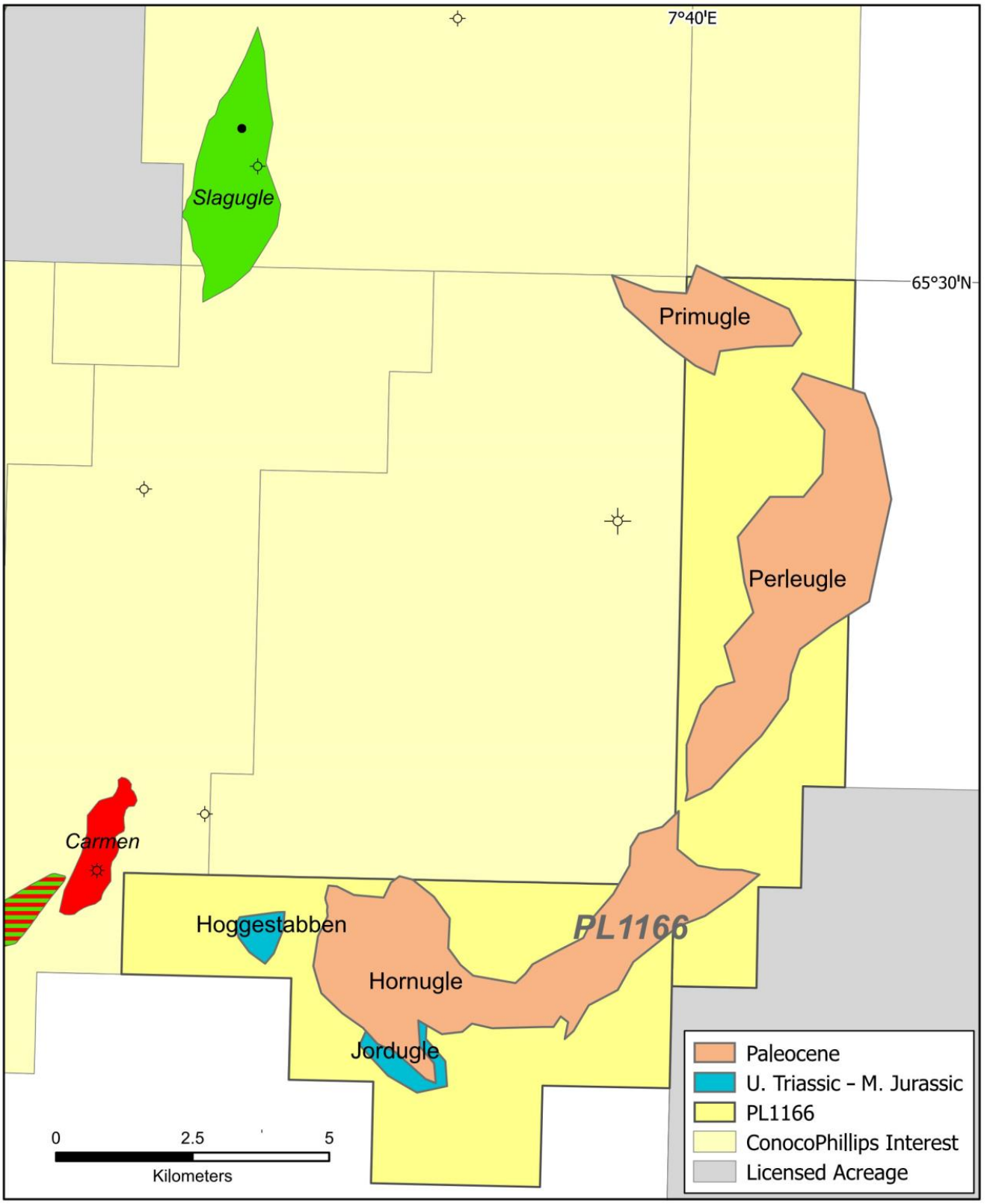
ConocoPhillips

PL1166
Status Report

Prepared by ConocoPhillips 2023



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1 Key License History

Production licenses is located east of the Heidrun field. It consist of part of block 6507/8 and 6507/9. ConocoPhillips Skandinavia AS was awarded operatorship for the license on 11.03.2022.

The partnership in PL1166 consist of

- ConocoPhillips Skandinavia AS 70%
- Pandion Energy AS 30%

The original work obligations of G&G studies were concluded by integrating the result of the Slagugle appraisal well 6507/5-11 into the license evaluation.

The partnership decided to drop the license at the drill or drop deadline 11.03.2023 based on the conclusion that the primary Paleogene prospect, Hornugle, has a very low likelihood of reservoir presence based on the results from the 6507/5-11 well. The 6507/5-11 Slagule appraisal well tested an amplitude response similar to Hornugle (Brilleugle lead), and the prospective intra Tang Fm. reservoir interval proved to be absent, and the amplitudes were confirmed to be caused by soft shales with Diatoms and tuff in the Tare Formation. The additional prospect and leads in the license are too high risk and limited reward to continue further license work at this time.

1.1 License Meetings

One combined EC/MC meeting was held December 7 2022. Post well work on key well 6507/5-11 was done as part of the PL891 license with the same partnership.

2 Database

2.1 Seismic Database

The seismic data used in the licensed are shown in Fig. 2.1 and summarized in Table 2.1 . As part of the work program a proprietary licensing and full reprocessing of the PGS16909NWS was considered as an additional dataset to the PL1166 common database in case a reservoir in the Tang Fm. was proven in the Slagugle Appraisal well. Since the outcome of the 6507/5-11 well was disappointing with regards to the Paleogene section, it was decided that additional seismic data should not be added to the common seismic database.

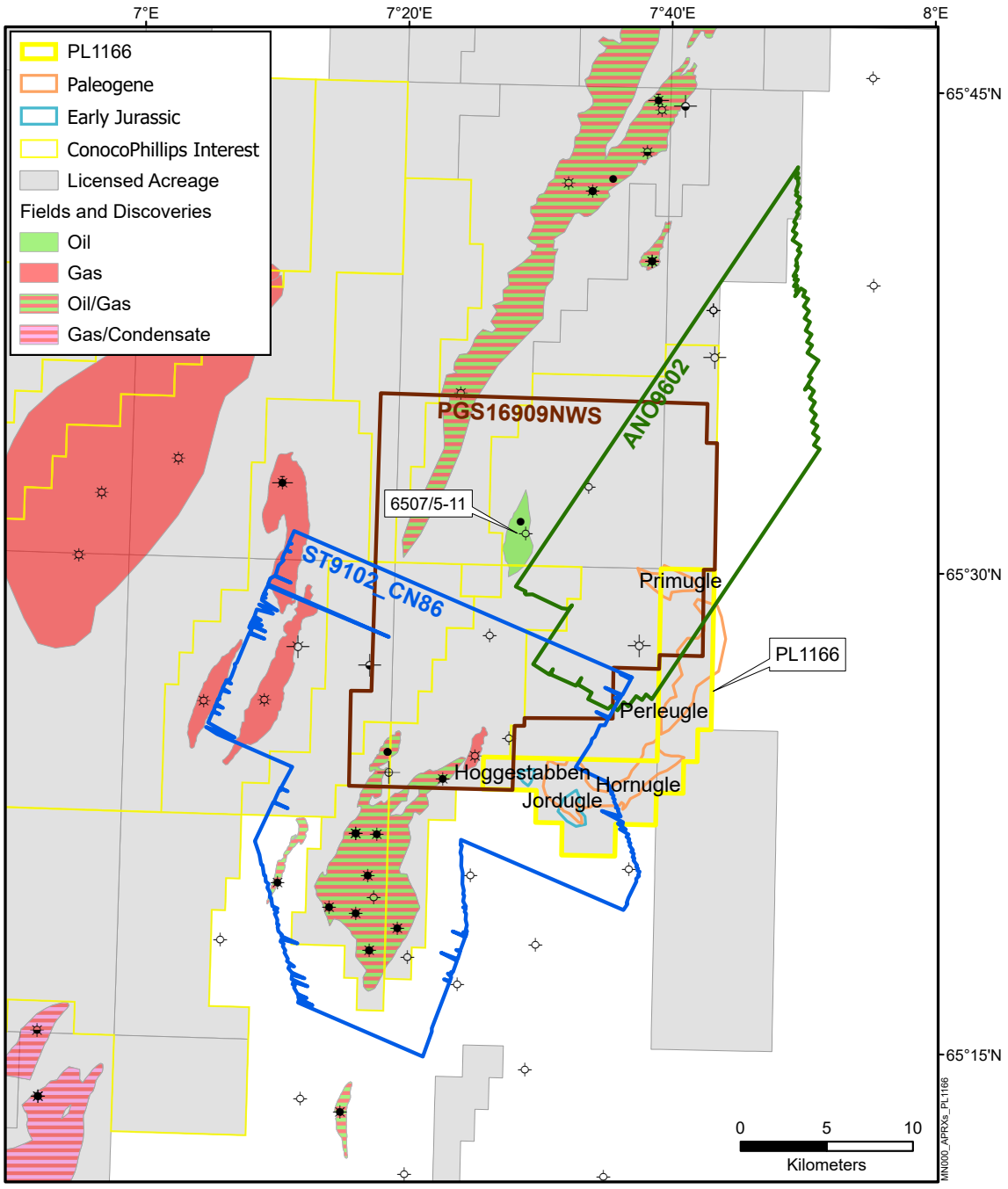

Fig. 2.1 PL1166 Seismic database

Table 2.1 Seismic Database

Seismic survey	Original data	NPDID	Status	Comments
ANO9602	Unique	3753	Available	Released full stack data
ST9102	Unique	3451	Available	Released full stack data
MC3D-HVG2011	Unique	7379	Available	Used in PGS16909NWS merge
MC3D-HVG2012	Unique	7616	Available	Used in PGS16909NWS merge
MC3D-HVG2013	Unique	7900	Available	Used in PGS16909NWS merge
PGS14002	Unique	7993	Available	Used in PGS16909NWS merge
PGS16909NWS	MC3D-HVG2011, MC3D-HVG2012, MC3D-HVG2013 and PGS14002		Available	Regional 3D merge of four PGS broadband surveys. Depth migration.

2.2 Well database

The license used all released wells in addition to the 6507/5-10 S and 6507/5-11 wells in neighbouring license PL891 (Table 2.2).

Table 2.2 Well Database

Wells	Drilling year	TD m MD RKB	NPDID	TD Age	Operator	Content	Availability	Relevance to prospect
6507/5-11*	2022	2306	9546	Triassic	ConocoPhillips	Dry	Operator/Partner	Seismic tie, Reservoir identification and rock physics
6507/8-5*	1991	2000	1749	Jurassic	Den norske stats oljeselskap	Dry / No Paleogene reservoir	Released	Seismic tie & Reservoir identification
6507/8-6*	1993	2850	2183	Triassic	Den norske stats oljeselskap	Oil shows in Melke Fm. / Some Paleogene reservoir	Released	Seismic tie & Reservoir identification
6507/8-10S*	2020	2399	8991	Jurassic	Neptune	Dry / No Paleogene reservoir	Released	Seismic tie & Reservoir identification
6507/5-10S*	2020	2214	9149	Triassic	ConocoPhillips	Oil in Båt Gp	Operator/Partner	Seismic tie & Reservoir identification
6507/3-2	1997	2032	2954	Triassic	Den norske stats oljeselskap	Dry gas in Fangst Gp	Released	Seismic tie
6507/5-3	2000	3000	4059	Cretaceous	BP Amoco	Gas in Lysing Fm	Released	Seismic tie & Basin modelling
6507/5-7	2014	1598	7428	Jurassic	E.ON	Dry	Released	Seismic tie
6507/6-1	1986	4040	910	Triassic	Saga	Dry gas in Åre Fm	Released	Seismic tie
6507/6-4 S	2012	4957	6725	Permian	E.ON Ruhrgas	Dry	Released	Seismic tie
6507/7-1	1984	4814	138	Lower Jurassic	Conoco	Gas shows in Fangst Gp	Released	Seismic tie & Basin modelling
6507/7-2	1985	3262	464	Jurassic	Conoco	Oil/gas in Fangst & Båt Gps	Released	Seismic tie
6507/7-6	1986	2525	922	Jurassic	Conoco	Oil/gas in Fangst & Båt Gps	Released	Seismic tie
6507/7-10	1993	3309	2182	Triassic	Conoco	Oil shows in Jurassic	Released	Seismic tie & Basin modelling
6507/7-12	1999	3976	3812	Jurassic	Conoco	Oil shows in Lange Fm	Released	Basin modelling
6507/7-13	2001	2623	4213	Jurassic	Conoco	Oil in Åre Fm	Released	Seismic tie
6507/7-14S	2010	4534	6367	Jurassic	RWE Dea	Gas in Fangst Gp	Released	Basin modelling
6507/7-16S	2019	3238	8909	Jurassic	DNO North Sea	Oil/gas in Fangst Gp	Released	Seismic tie
6507/8-3	1988	2075	1309	Triassic	Den norske stats oljeselskap	Dry gas in Fangst Gp	Released	Seismic tie

3 Review of Geological and Geophysical studies

The key challenge and uncertainty for the PL1166 is the presence of an intra Tang Formation sandstone. Reservoir presence was considered a key play risk that would be tested with the 6507/5-11 in the PL891 license. The 6507/5-11 did not encounter the Tang Formation nor any Paleogene reservoir sands, and the play risk for intra Tang Formation sands has increased. Since the Tang Formation sands was needed as a carrier bed for the charge the overall play risk for charge have also increased.

The 6507/5-11 drilling and data acquisition efficiently has polarized the risk for the presence of intra Tang Formation sand, and hence invalidated the Hornugle prospect, limited special studies were conducted in the PL1166 license.

- **Rock Physics:** Rock physics analysis were conducted on the 6507/5-11 well to assess the amplitude observation at the Hornugle location compared to what was found in the well. It was concluded that the intra Tare Formation soft shale with diatoms was causing the reflector observed at the 6507/5-11 well location, which increase the likelihood for similar lithologies to cause the amplitudes at Hornugle location.
- **Seismic Interpretation and Well Tie:** The additional key well 6507/5-11 was tied to seismic data, and prospect based seismic interpretation was conducted in and around the license area.
- **Depth Conversion:** The regional velocity models used at the time of APA application for the Hornugle prospect were updated locally using the data acquired in the 6507/5-10S and 6507/5-11 wells.
- **NOROG/Wellify.ai:** Cuttings Insight project that is developing a cloud based visualization and analysis platform for the scanned cuttings images arising from the NOROG/Rockwash cuttings image project.
- **Petrography:** As part of the post well analysis on the 6507/5-11 Slagugle appraisal well in PL891, a non-acid siliceous microfaunal analyses and thin section petrography study was conducted on cuttings from the lower Brygge Fm and Rogaland GP ([1]). Rigsite cuttings descriptions from the Rogaland GP interval, were the secondary Brilleugle lead was mapped, were described as 100% shale with traces of limestone. The petrography analysis described the section as bio-siliceous sediments with a clear downhole decrease in fossile assemblages. The low density/slow velocity interval setting up the clear seismic soft event, that was mapped out as the Brilleugle lead pre 6507/5-11, is a shale with some poorly preserved diatoms. Dolomite crystals and tuffs are also common in the samples. The tuffs are partially altered to palagonite/leucoxene.

4 Prospect Updates

The target prospect in the PL1166 license was the Paleogene Hornugle prospect located 13km SE of the Slagugle discovery (Fig. 4.1). At the time of APA application, the Hornugle prospect was characterized as a 14% PoS opportunity with key risk being reservoir presence and hydrocarbon charge. The relative high reservoir presence risk is due to limited evidence for Intra Tang Formation sand in the Southern Sør High area. Detailed analysis of the drill cuttings and microscopic analysis of the sidewall core material recovered in the 6507/5-10 S (Slagugle discovery wellbore) shows that most of the Tang formation is shale prone with an abundance of re-mineralized bio-siliceous and tuffaceous rock fragments. A proper sandstone interval was not penetrated in this well. The near Top Tang amplitude map in Fig. 4.2 indicate that the 6507/5-10 S did not penetrate any strong amplitudes that are present elsewhere proximal to the southern Sør High. The geological model proposed based on seismic amplitudes and available accommodation space (Fig. 4.3) is local erosion of the Sør High with shelfal sands depositing proximal around the Sør High as illustrated in Fig. 4.4. This model is weakly supported by evidence of a sandstone in the lowermost Tang Formation and potentially the uppermost Cretaceous section in the 6507/8-6 well (NOROG/Wellify.ai study). The thickness map of the BCU to Top Tang Formation interval (Fig. 4.3) indicate that along the southern and western part of the southern Sør High, a 1-3km wide shelf area was present with accommodation space from 0-30 meters of Tang Formation. Longshore transport of the shelfal sands could have occurred, and would contribute to cleaning of the sandstones.

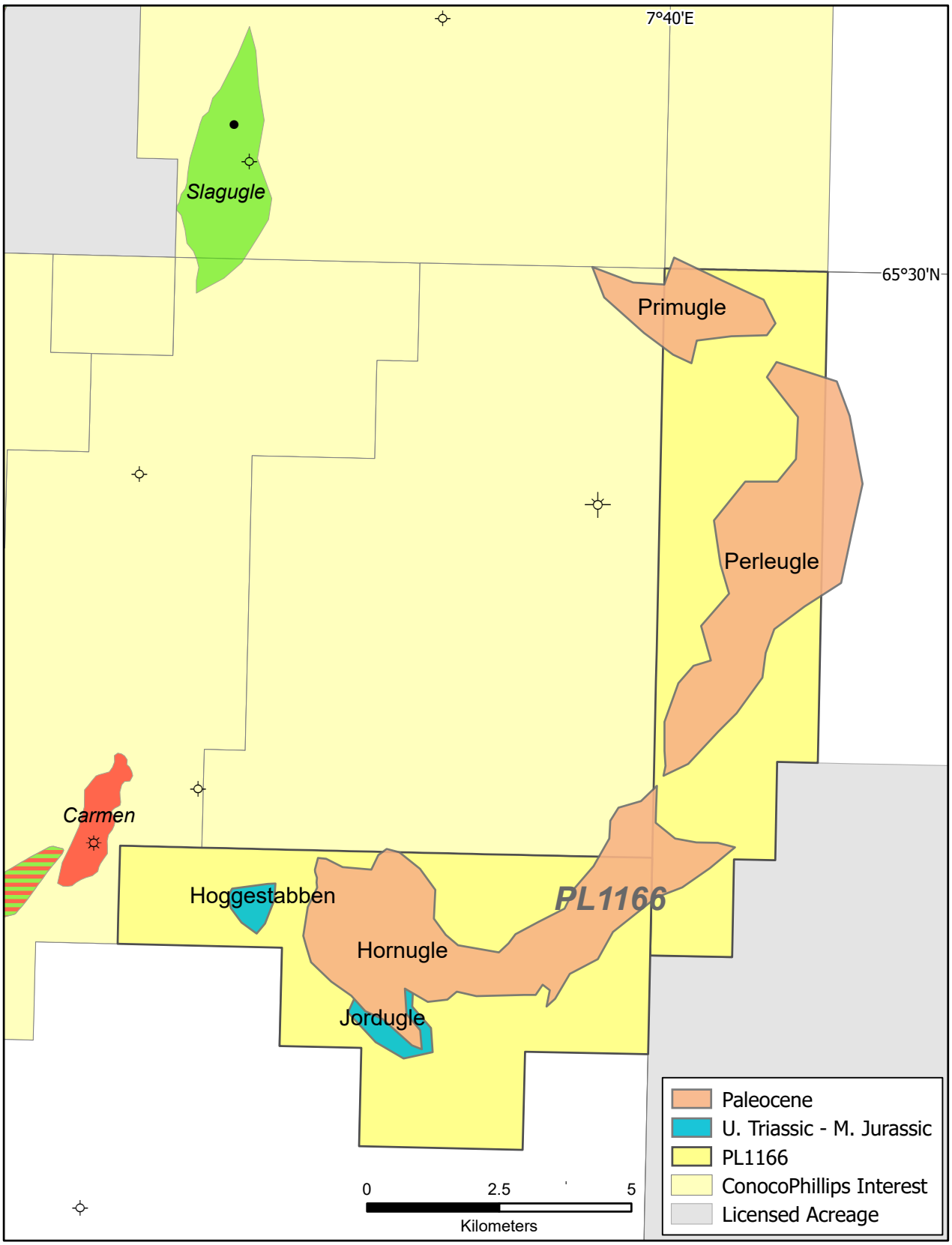

Fig. 4.1 PL1166 Area Map Outline of the Hornugle prospect and additional leads in the PL1166 license.

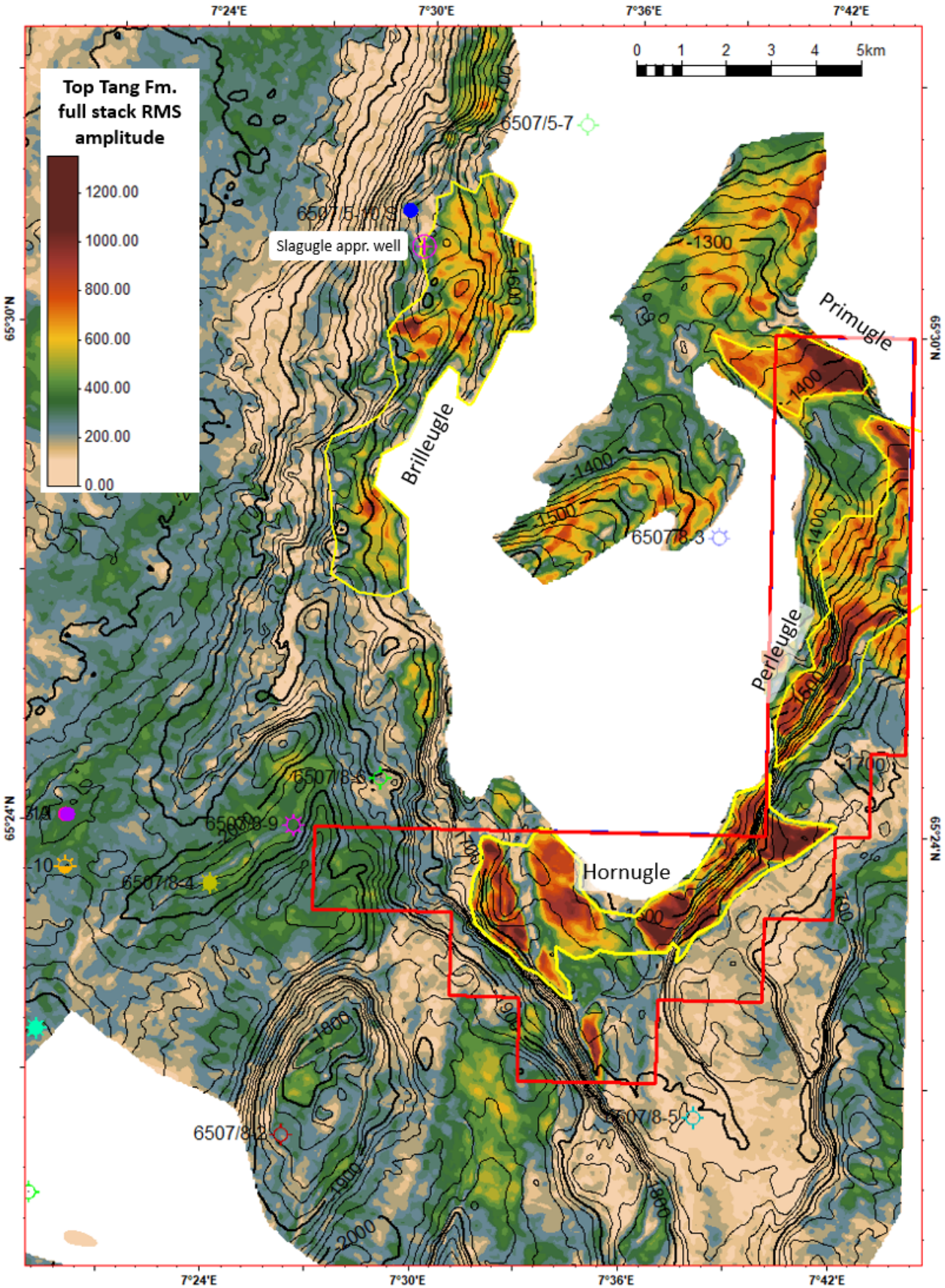

Fig. 4.2 Root mean square (RMS) amplitude map of the near Tang Formation Full stack RMS amplitude map of the Tang Formation. Interval from 8ms above the reflector to 8ms below the reflector

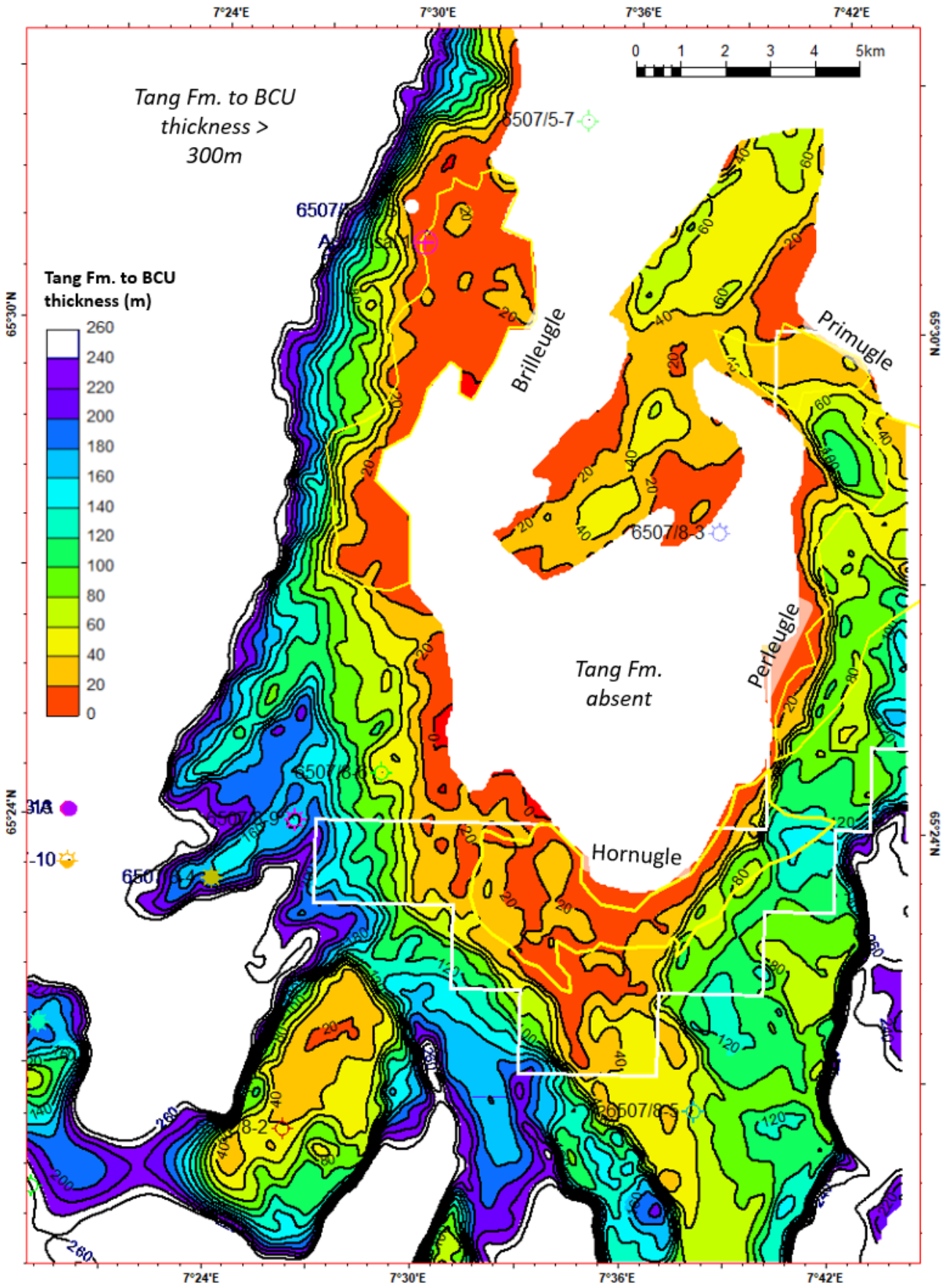

Fig. 4.3 Thickness map (m) of the near Top Tang Formation pick to the BCU

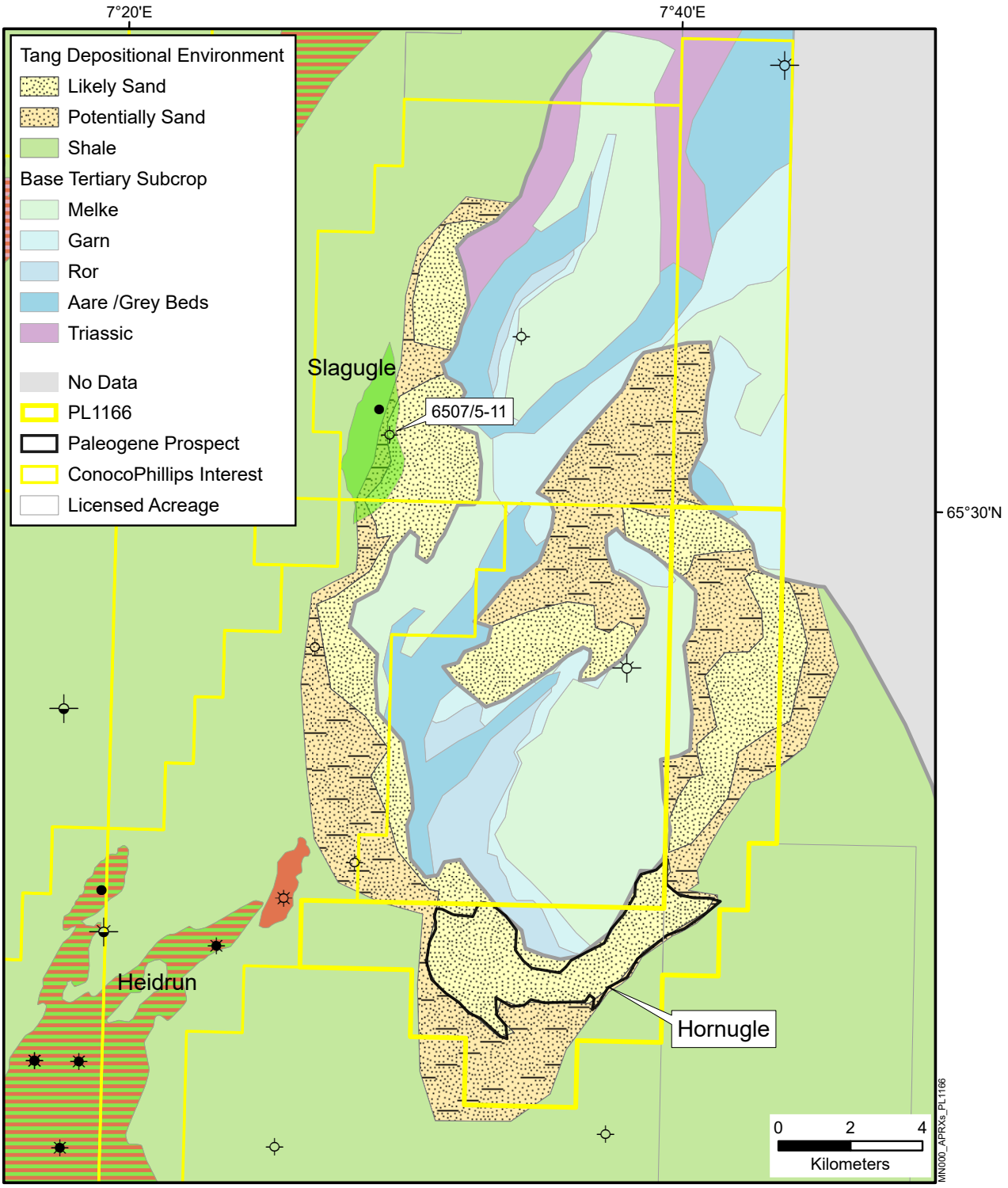

Fig. 4.4 6507/5-11 Pre-drill depositional Environment map of the Tang Formation along the southern Sør High
Potential distribution of Tang formation sandstones around the Sør High.

At the time of APA application play risk for presence of intra Tang Formation sand reservoir was set to 0.6, and prospect risk was set to 0.9, given that the reservoir would have been proven at a play level by the 6507/5-11 Slagugle Appraisal well. Charge was the second highest risk element given a play risk of 0.7, and a prospect risk of 0.75. Charge play risk is to a large degree dependent on presence of intra Tang Formation sand since it will act as the main carrier bed for hydrocarbon migration into the Hornugle area. Trap risk was set to 0.8. The overall trap is well defined stratigraphic trap mapped on 3D seismic data. Remaining trap risk is primarily in the NE corner where pinch out and faulting are more weakly defined. It was acknowledged during APA that seismic re-processing could improve the trap risk, but this option was not pursued as 6507/5-11 drilling efficiently invalidated the Hornugle prospect. Seal and retention was risked at 0.6 as it requires both an efficient top and base seal, and absence of sub seismic thief sands. All the risk elements at time of the APA application are summarized in Table 4.1.

Table 4.1 Risk Table for Hornugle at APA evaluation

Prospect	P1 Reservoir	P2 Trap	P3 Charge	P4 Retention	P Discovery (Ps)
Hornugle	0.54	0.8	0.53	0.6	0.14

6507/5-11 Slagugle Appraisal well results

The 6507/5-11 well was drilled to appraise the Jurassic/Triassic Slagugle discovery in the PL891 license. A secondary objective of the 6507/5-11 well was to test the bright amplitudes interpreted to be intra Tang Formation comprising the Brilleugle lead and the casing scheme was designed accordingly. 6507/5-11 is drilled up-dip of the 6507/5-10 S well in the intra Tang Formation (Fig. 4.5), within the high amplitude area defining the Brilleugle lead (Fig. 4.2). Post well biostratigraphic dating indicated that the Tang interval was absent, and the lithologies correlated to the seismic amplitudes proved to be younger within the Eocene Tare Formation. The low velocity/density zone in the Tare Formation is shale with tuff and poorly preserved/recrystallised diatoms (Fig. 4.6). There are no indications of sand in this interval. Well to seismic calibration of the 6507/5-11 well (Fig. 4.7) and seismic interpretation towards the Hornugle lead confirmed that the amplitudes defining the Hornugle lead (Fig. 4.2) can be correlated to the intra Tare Formation soft shales logged in the 6507/5-11 well. It is possible that the amplitude shut off in this interval is due to Opal CT transition (2022 Petrostrat Report.) The lack of evidence for sand in the 6507/5-11 well significantly increase the reservoir presence risk for the Hornugle prospect. It is acknowledged that the 6507/5-11 well did not penetrate the strongest amplitudes, and that there is a minor possibility for local deposited sands around the southern Sør High corresponding to the strongest amplitudes.

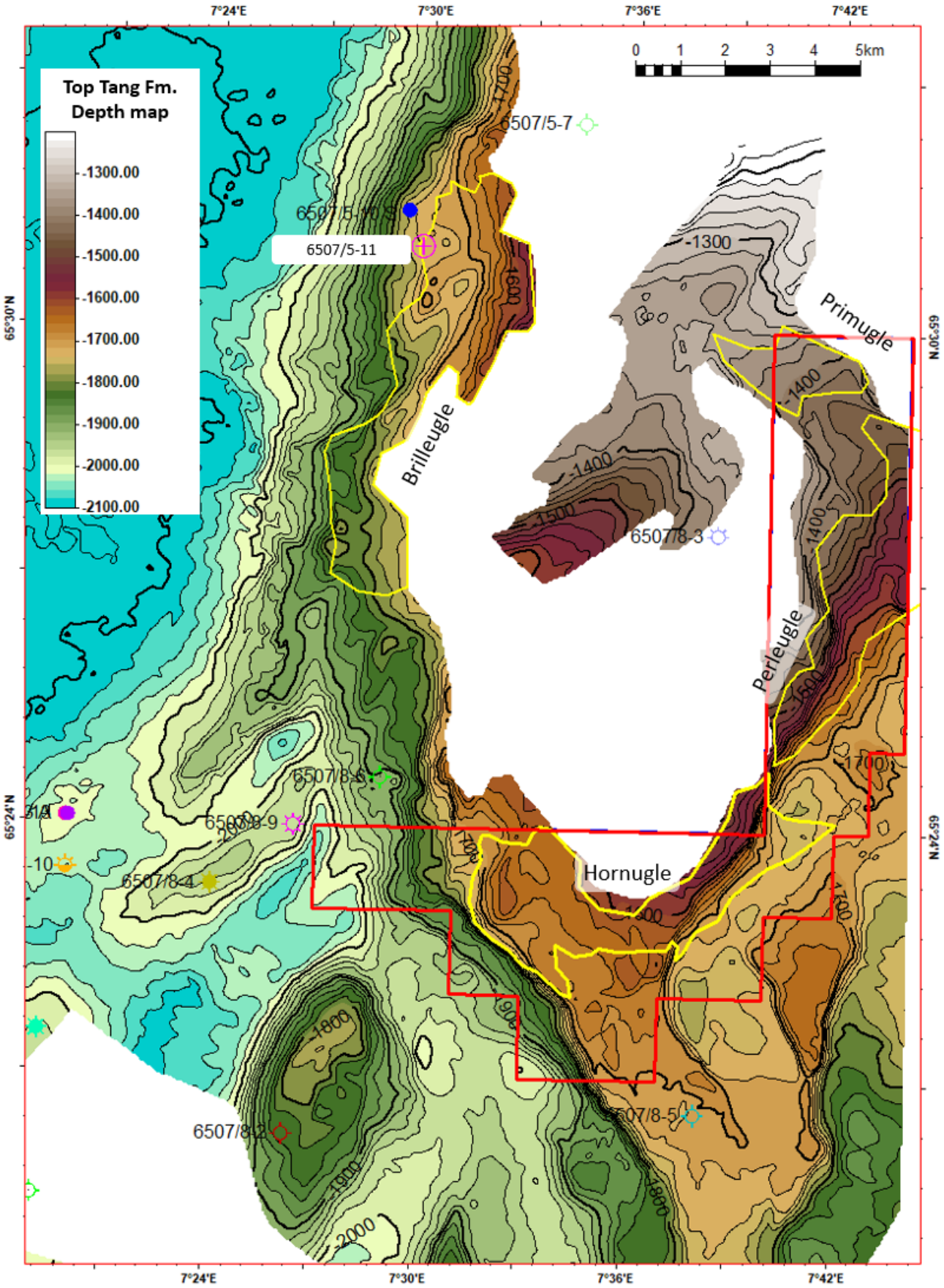

Fig. 4.5 Near Top Tang Formation Depth map

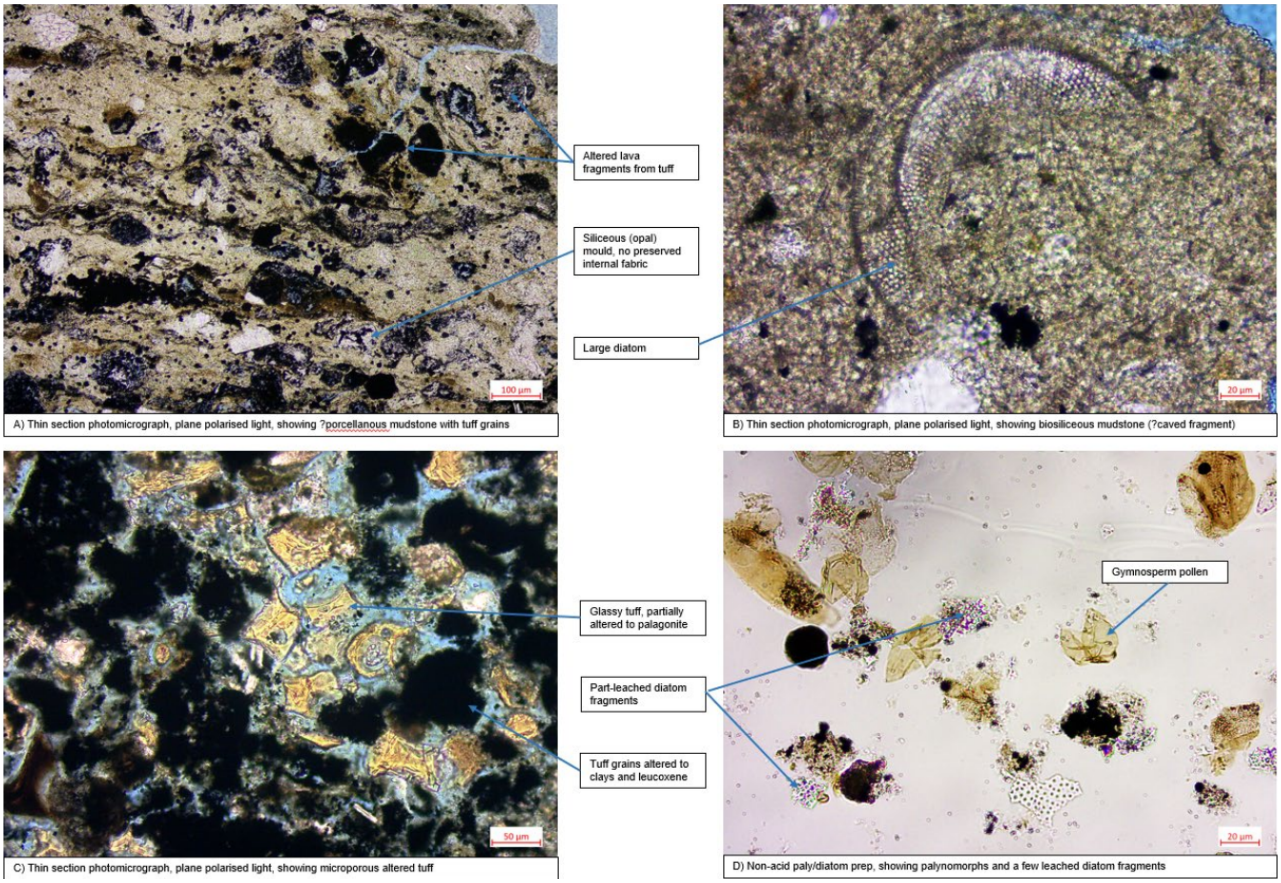

Fig. 4.6 Thin section and paly-prep seperates of siliceous microfossil material in cuttings from 1763m in the Tare Fm (Brilleugle lead interval) in well 6507/5-11

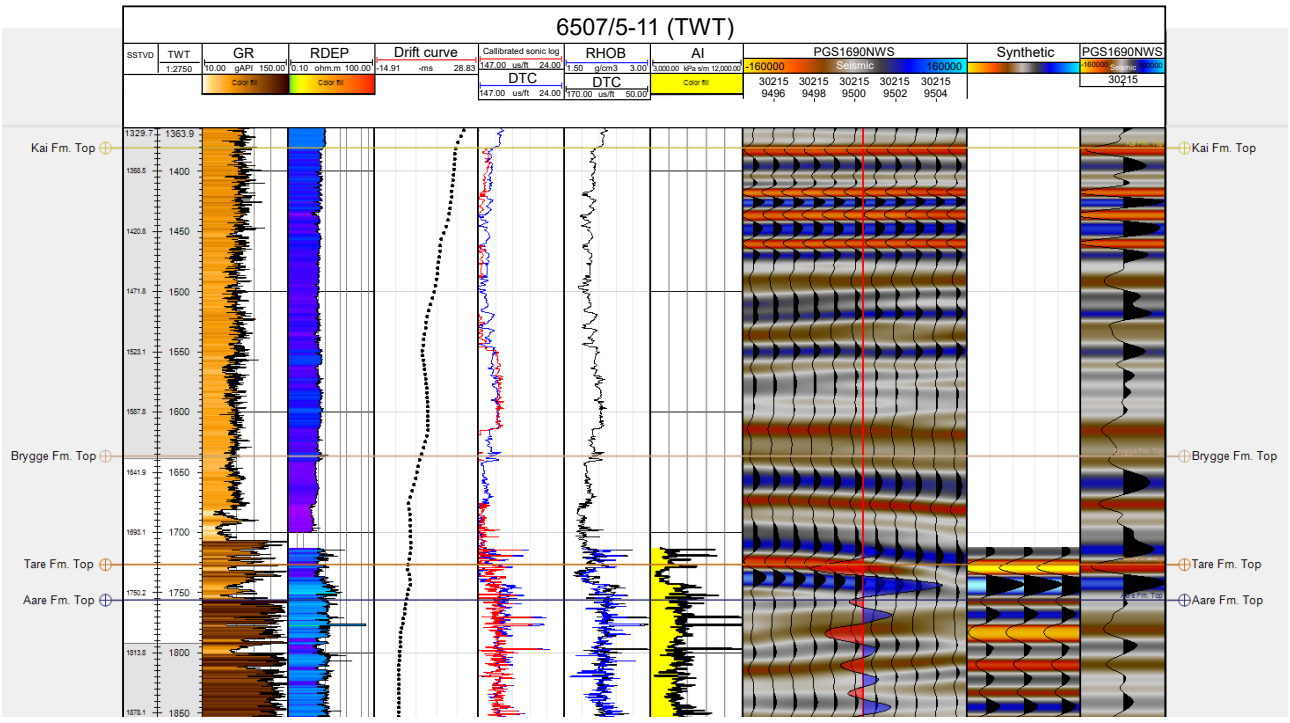

Fig. 4.7 6507/5-11 Well to seismic callibration

Hornugle Resource Evaluation and Updated Risk

The PL1166 work program addressed the risk of the Hornugle prospect. The resource potential has not changed since APA awards and is summarized in Table 4.2. As discussed, the drilling of the 6507/5-11 well have efficiently invalidated the intra Tang Formation reservoir model and the Hornugle prospect. The play risk for presence of intra Tang Formation sand has been reduced to 0.2 resulting in an overall P Discovery (Ps) of 5% for the Hornugle prospect.

Table 4.2 Hornugle Resource Potential

Discovery/ Prospect/ Lead name [1]	D/ P/ L [2]	Case (Oil/ Gas/ Oil&Gas) [3]	Unrisked recoverable resources [4]						Probability of discovery [5] (0,00 - 1,00)	Resources in acreage applied for [%] [6] (0,0 - 100,0)	Reservoir		Nearest relevant infrastructure [8]	
			Oil [10^6Sm^3] (>0,00)			Gas [10^9Sm^3] (>0,00)					Litho-/ Chrono-stratigraphic level [7]	Reservoir depth [m MSL] (>0)	Name	Km (>0)
			Low (P90)	Base (Mean)	High (P10)	Low (P90)	Base (Mean)	High (P10)						
Hornugle	P	Oil	2.97	7.03	11.90	0.07	0.18	0.32	0.14	99.2	Tang Fm/ Paleogene	1520	Heidrun	10

Additional Leads

The Perleugle and Primugle are leads (Fig. 4.1) based on the same play model as the Hornugle prospect. As the work program has invalidated the intra Tang Formation reservoir model, the Perleugle and Primugle leads are also considered invalidated. The Jurassic Jordugle and Hoggestabben leads are small fault bound structures that would be interesting only in the success case on Hornugle.

5 Technical Evaluations

No new development and economical evaluation of the Hornugle prospect have been performed post APA application due to the very high risk (Ps. 5%).

6 Conclusions

The conclusion from the PL1166 work program is that the Hornugle prospect is a high risk opportunity (Ps. 5%). The main risk is the presence of intra Tang Formation reservoir and migration path which has been efficiently invalidated by the 6507/5-11 well.

The additional leads within the license are considered to risky or small for drilling consideration.

The partnership has unanimously decided to relinquish PL1166 in its entirety.

References

1 2022 Petrostrat Report PS22-079 - Biostratigraphy of Well 6507/5-11 (Slagugle), Offshore Norway.