WELLESLEY
PETROLEUM

Status report surrender

WELLESLEY PETROLEUM

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1 History of the production licence

PL931 was awarded on the 2nd of March, 2018, in the APA 2017 licensing round. Wellesley Petroleum AS is the license operator and DNO Norge AS is the license partner with 60% and 40%, respectively. The license is located in the Mardolf and Mode Sub-Basins and covers 486.178 km² within blocks 34/6, 35/4, 34/9 and 35/7, shown in Fig. 1.1.

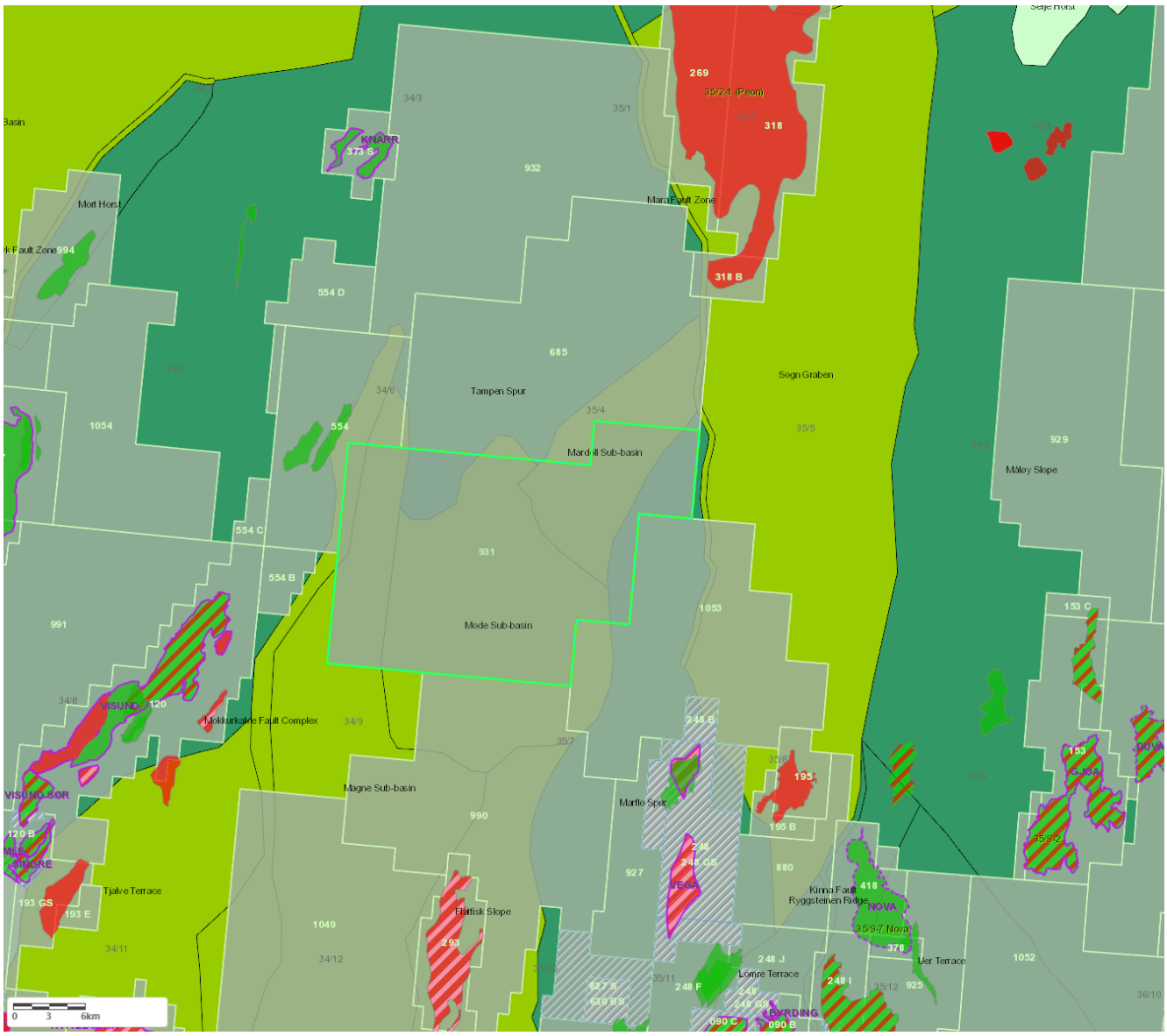

Fig. 1.1 License area PL931 in structural settings

The PL931 work commitment was to conduct G&G studies in the first year prior to taking a drill or drop decision. In addition to the primary reservoir target in the Pliocene clinoforms, the underlying injectites in the Hordaland Gp could also contain significant hydrocarbon volumes. Wellesley proposed to evaluate the complete Cenozoic section in the area applied for and study all prospective intervals.The work commitment also included completing an EM feasibillity study.

Wellesley Petroleum has, on behalf of the license group, fulfilled the work commitment and made the decision to drill Well 35/4-2. The license decision gates for PL931 are presented in Table 1.1.

Table 1.1 PL931 License decision gates

Work obligation	Decision	Task status	Expiry date	Wellbore drilled
Study of geology and geophysics		Approved		
	Decision to drill	Will be drilled	02.03.2019	
Drill exploration well		Approved		35/4-2
	(BoK) Decision to concretize	In process	02.03.2021	
Conceptual studies		In process		
	(BoV) Decision to continue	In process	02.03.2023	
(PDO) Prepare plan for development		In process		
	(PDO) Submit plan for development	In process	02.03.2024	
	Decision to enter extension period	In process	02.03.2024	

License meetings

EC/MC meeting 1: 05.03.2018

EC meeting 2: 07.05.2018

EC/MC meeting 3: 09.08.2018

EC/MC meeting 4: 29.10.2018

EC/MC meeting 5: 11.04.2019

EC/MC meeting 6: 02.10.2019

Status meeting: 26.09.18

Data acquisition workshop: 13.12.2018

Reason for relinquishment

Well 35/4-2, Songesand, was drilled in February 2019 and was dry. All the post well studies have been completed and incorporated into the failure analysis of the well. The learnings have been transferred to other prospectivity within similar stratigraphy outside of PL931 which has been downgraded. Prospectivity was assessed over the entire stratigraphy and the remaining leads in the Eocene (injectites) and Jurassic are considered too high risk.

2 Database overviews

2.1 Seismic data

Table 2.1 PL931 Seismic database

Survey	NPD ID	Country	Status	Area km²	Version	Quality
CGG17M01	8179, 8194, 8195, 8196, 8252, 8332, 7984	Norway	Licensed	1265 km² in common database for PL931 (35000 km² in total)	Pre-stack and post stack data sets from intermediate and final products. Enhanced FastTrack Merge and Final processing.	Very good
WP18302	8622	Norway	Licensed	180	2D Fullstack	Very good
Z2NAM1990A91A		Netherlands	Public		2D Fullstack	Poor
Z3WIN2000A		Netherlands	Public	615	3D Fullstack	Medium to poor

2.2 Well data

The well database used in the license work is presented in Table 2.2.

Table 2.2 Well database

Exploration wellbores	NPD ID	Location	Operator	Year drilled	Formations comments	Petrophysics	Depth Conversion	Well tie	Rock Physics	Released
34/2-1	420	NW of PL931	Amoco Norway Oil Company	1980	-					Yes
34/2-2 R	497	NW of PL931	Amoco Norway Oil Company	1980/1981	-	x		x	x	Yes
34/2-3	421	NW of PL931	Amoco Norway Oil Company	1981	Shallow gas between 820m and 890m, up to 7% total gas. TD in Lunde Fm.				x	Yes
34/4-1	422	W of PL931	Saga Petroleum ASA	1979	-	x				Yes
34/4-7	943	W of PL931	Saga Petroleum ASA	1987	Two minor shallow gas peaks (in Quaternary section and in intra Pliocene)					Yes
34/5-1 A	6352	W of PL931	BG Norge AS	2010	-	x			x	No
34/7-1	111	W of PL931	Saga Petroleum ASA	1984	-	x				Yes
34/7-8	878	W of PL931	Saga Petroleum ASA	1986	-	x		x	x	Yes
34/10-6	429	SW of PL931	Den norske stats oljeselskap	1979/1980	-	x				Yes
34/10-10 R	859	SW of	Den norske stats oljeselskap	1980	Shallow gas flow from sand at 428m depth.	x				Yes

Exploration wellbores	NPD ID	Location	Operator	Year drilled	Formations comments	Petrophysics	Depth Conversion	Well tie	Rock Physics	Released
		PL931								
34/10-15	67	SW of PL931	Den norske stats oljeselskap	1982	Encountered same gas flowing sand as 34/10-10R from 444m-447m depth.	x				Yes
35/2-1 R (Peon)	5376	NE of PL931	Norsk Hydro	2006	Dry gas in Nordland Gp. TD in Nordland Gp.	x	x		x	No
35/2-2	6084	NE of PL931	Statoil Hydro Petroleum	2009	Dry gas in Naust Fm. TD in Naust fm.	x			x	No
35/4-2	8633	In PL331	Wellesley Petroleum	2018	Dry	x	x	x	x	No

3 Results from geological and geophysical studies

EM feasibility study - EMGS, 2017. Conducted an EM feasibility study for two different prospect scenarios, as it was challenging finding good offset data at this shallow depth. The results showed that the two reservoirs provide the same EM-response and suggested that the Songesand target was unlikely going to be seen on EM.

Post-well Studies

Multiple studies were conducted following the drilling of the Songesand well, 35/4-2, as part of the post-well analysis. These included cuttings analyses, SWD VSP processing, biostratigraphy to incorporate the new well in an updated biostratigraphic framework, geochemistry to assess the gas composition in the mud gas, and SpecCam (Infra-red Spectroscopy) to assess the quality and clay composition of encountered Pleistocene reservoir.

Geoflex - Schlumberger, 2019. High resolution photography of cuttings while drilling to show bulk mineralogy using XRD. This help see sandy intervals and distribution of silt and sands.

Grain size quantification/sieving - Stratum Res, 2019. Cutting samples from reservoir section were dominated by silt and vf-f-m sized sand grains.

Hydrocarbon cuttings scanning - Stratum Res, 2019. All values above the hydrocarbon detection threshold are caused by the presence of fluorescing carbonates of various origins and not hydrocarbons. No distinct GOC or OWC/paleo-OWC contacts were identified.

Seismic While Drilling VSP processing - Schlumberger, 2019. Helped to tie the well and calibrate seismic observations. It was also used in pilothole to calibrate depth before the mainbore was drilled. Very good quality data recorded downhole.

Biostratigraphic review - Ichron, 2019. Performed a biostratigraphic review of cuttings from the Pleistocene interval in Well 35/4-2.

Mud gas chemical analysis - APT, 2019. Assessed gas composition and stable gas isotopes in the mud gas. Results show biogenic gas in all samples and no evidence of thermogenic gas contributions. This is consistent with the pre drill expectations.

SpecCam - Spectra Map, 2019. Infra-red Spectroscopy to assess the quality and clay composition of encountered Pleistocene reservoir. Results show that variation in clay mineralogy and grain sizes are probably responsible for seismic observations.

4 Exploration Well 35/4-2

The Songesand Prospect is an under explored unconventional North Sea play, a play that has typically been considered a shallow gas. The Pliocene sequence of the northern North Sea is not registered as a play by the NPD.

Deposition of reservoir, seal and source within the Pliocene was controlled by sea level fluctuations. The Songesand Prospect was thought to be a gas play, charged by biogenic gas derived from organic matter within Pliocene claystones. Prospect identification was driven primarily by the seismic response of the gas-bearing sand. The prospect was thought to have a stratigraphic trap with lateral pinch-out, and sealed by Pliocene claystones. It was assumed that the reservoir was a Pliocene sand, deposited as a deep marine gravity flow during a period of sea-level low-stand. The Peon Discovery, about 6 km to the north of the prospect, proved biogenic gas within the Pleistocene and it seemed likely that Songesand Prospect was charged by the same system. The pre-drill prospect is illustrated with map and cross-sections in Fig. 4.1, Fig. 4.2 and Fig. 4.3 .

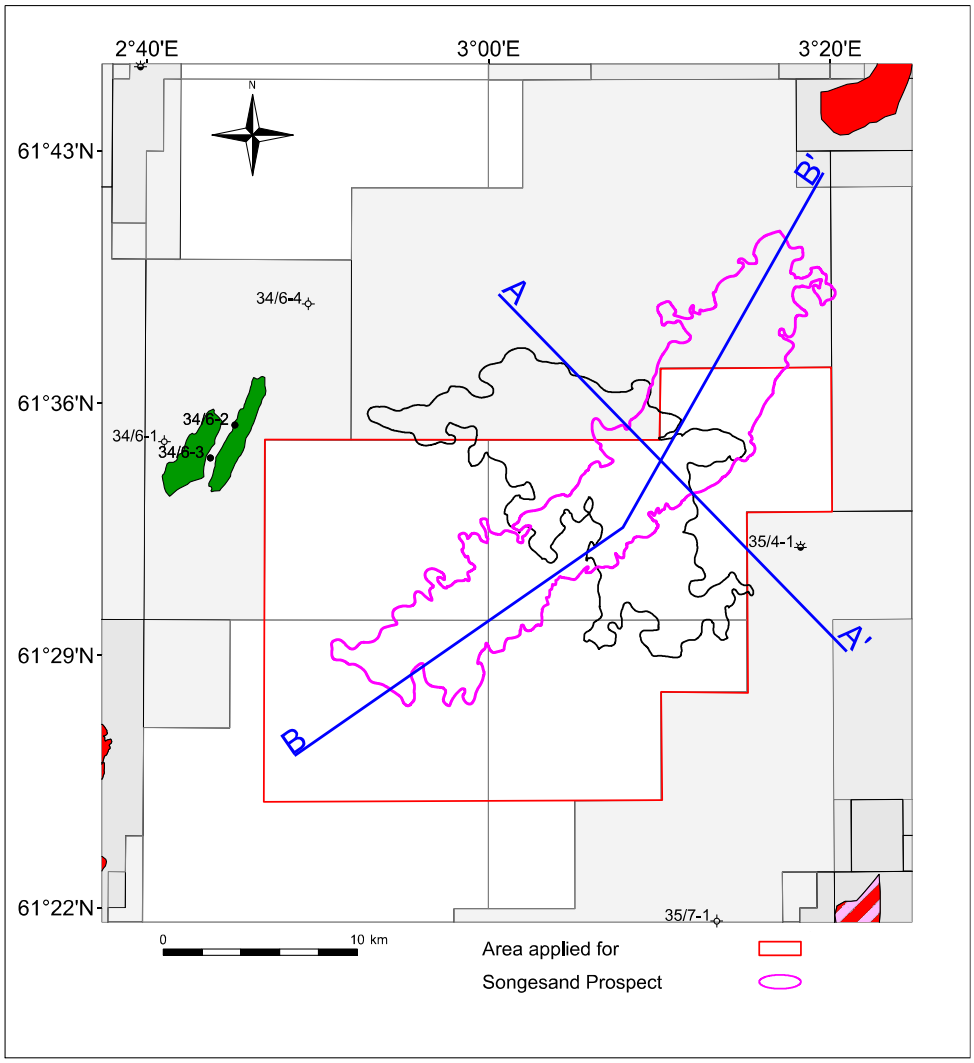

Fig. 4.1 Overview map of Songesand Prospect (pink) and Kroknes Lead (black).
The position of seismic line and geological profile in fig 4.2 is marked by blue line A-A'.

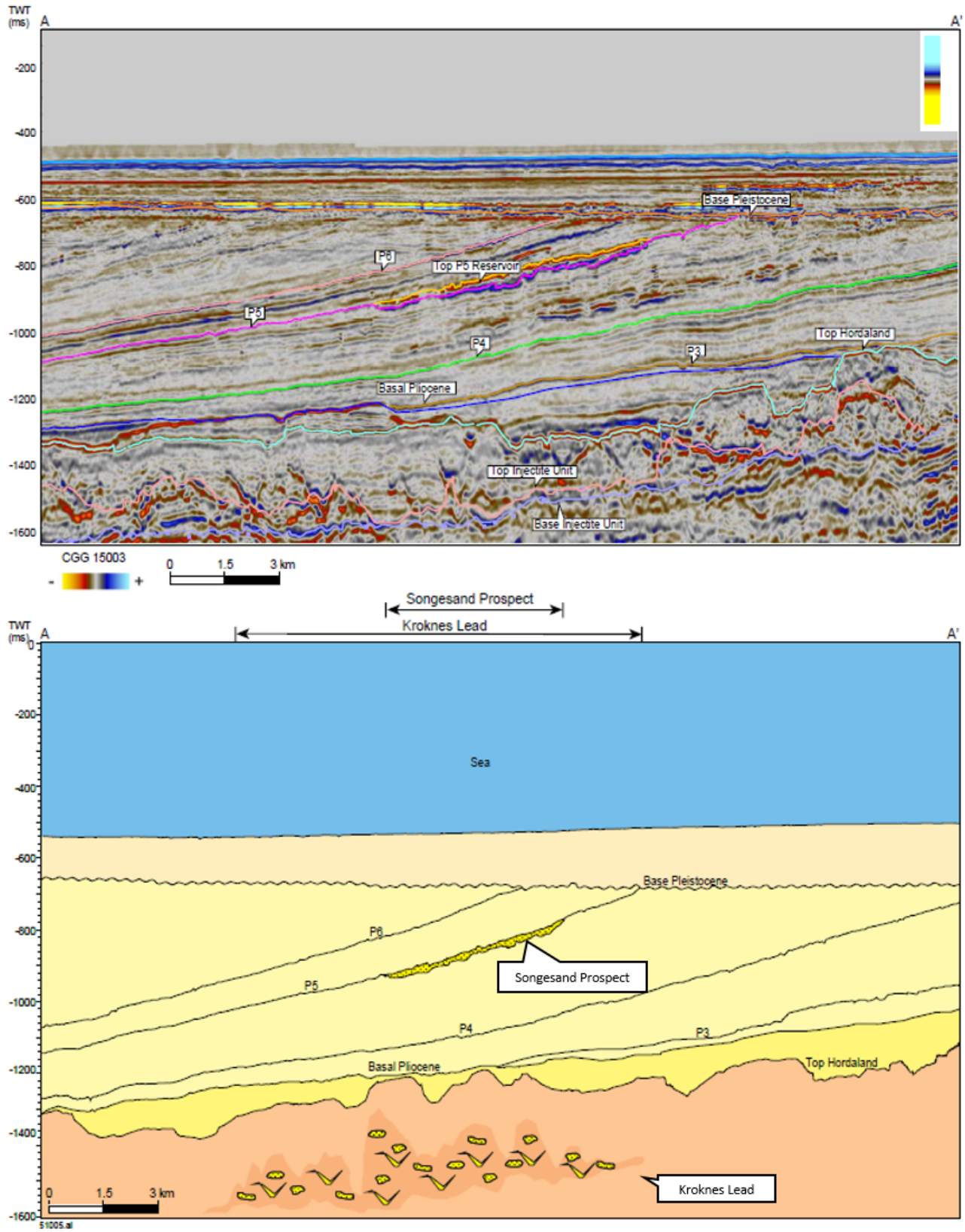

Fig. 4.2 Songesand Prospect: seismic and geoseismic dip section A-A'.
Location the section is shown in Fig. 4.1.

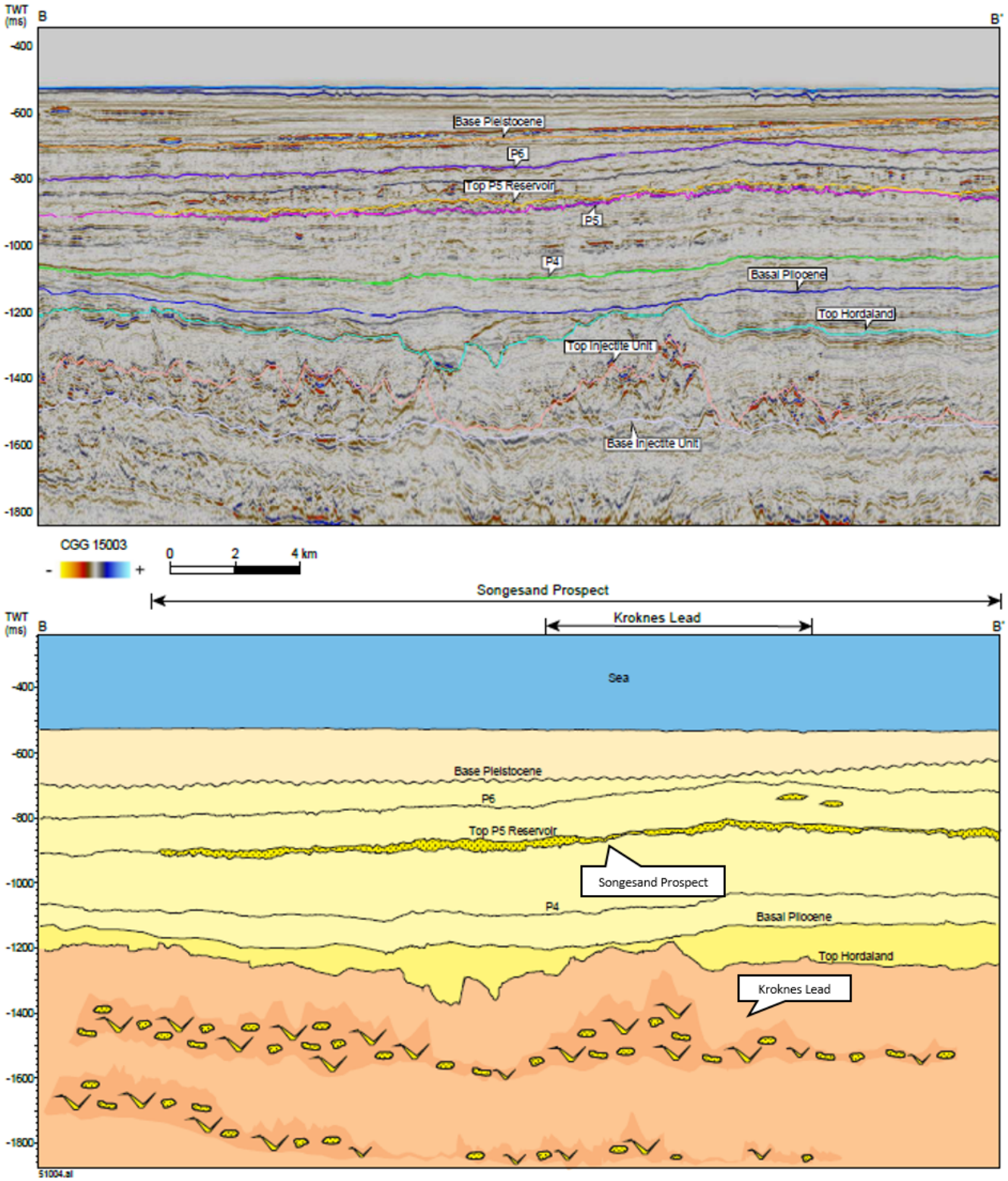

Fig. 4.3 Songesand Prospect seismic and geosection strike section line B-B'.
The location of the seismic and geoseismic sections is shown in Fig. 4.1.

The objective of the Songesand well 35/4-2 was to explore the gas potential in the intra Pliocene sand in the Naust Formation. The Transocean semi-submersible rig Transocean Arctic was employed, and the well was spudded on January 21st 2019 as 35/4-2.

Pilot well 35/4-U-1 (NPDID: 8634)

Drilled a 9 7/8" pilot well, 35/4-U-1, to the 35/4-2 surface casing setting depth to identify possible shallow gas, calibrate depth prognosis and reduce top reservoir depth uncertainty.

The bottom hole assembly (BHA) included MWD-LWD tools with gamma ray, resistivity, pressure, directional, sonic and seismic. The seismic while drilling was used to calibrate depth prognosis and reduce top reservoir depth uncertainty in the 8 ½" section in the main well 35/4-2.

Exploration well 35/4-2 (NPDID: 8633)

The 8 ½" section was drilled from 693 m MD RT to 771 m MD RT with 1.25 sg water-based mud. An MWD for inclination and directional control and LWD with resistivity, gamma-ray, density and neutron for formation evaluation were included in the drilling assembly.

A possible top "reservoir feature" was observed on LWD logs (slight decrease in GR, slight increase in Res) at 730 m MD RT. However, cuttings (siltstones), gas readings (0.37%) and LWD logs indicated a dry well. The decision was made to continue drilling to the prognosed base P5 sand to confirm any sand and its thickness, but no sand was observed within next 41 m and TD was set at 771 m MD RT.

5 Prospect update report

The Songesand prospect and Kroknes Lead are presented in map view in Fig. 4.1.

Songesand Prospect

The Songesand Prospect was drilled with exploration well 35/4-2, which is classified as dry (4 Exploration Well 35/4-2).

Post well analysis show that reservoir is likely present but poorly developed, see Fig. 5.1 for post drill geoseismic section. P5 & P5b clinoform cutting samples were dominated by silt and vf-f-m sized sand grains. This is confirmed by cuttings & sieving analysis as it is difficult to interpret with limited logs. The relatively high GR suggest a significant proportion of wet clay.

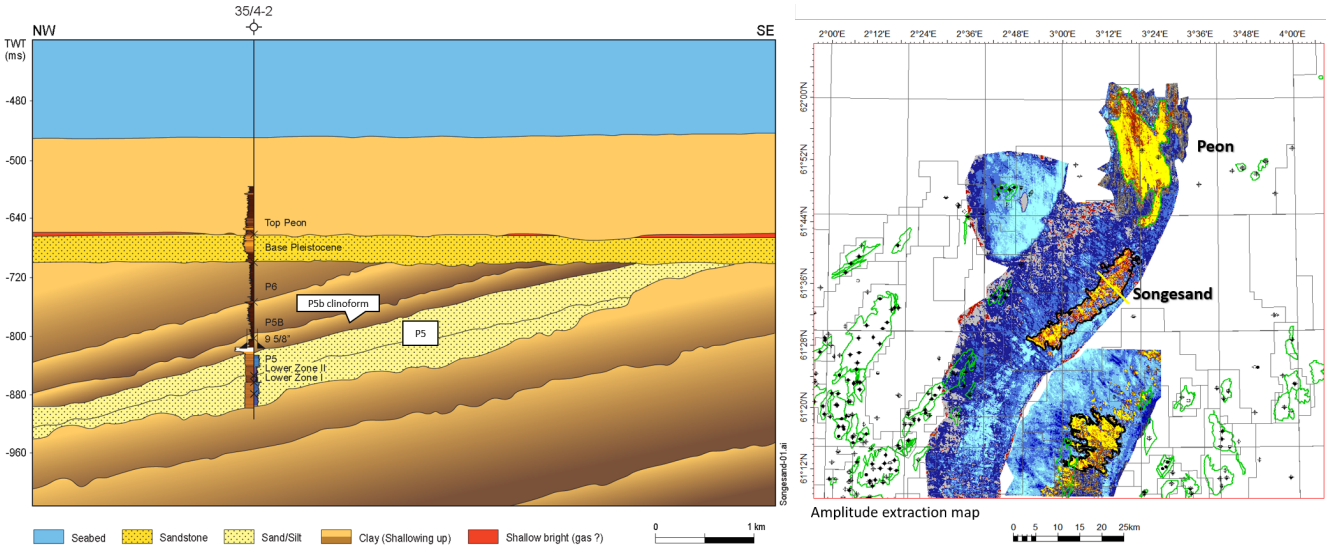

Fig. 5.1 Post drill geoseismic section

The reservoir is likely charged as the gas levels doubled during drilling despite low ROP. Gas tube analysis confirm presence of biogenic gas throughout interval, which means that it cannot be concluded that these sediments definitely do not contain hydrocarbons.

The top seal is likely not present, and therefore trap is likely not present. P5b clinoform was far ‘siltier/sandier’ than expected, and top of P5 clinoform is probably not top porosity. The pre-drill assumption that Top P5 clinoform was top porosity was key for trap presence. Pleistocene sediments truncate Pliocene clinoforms, and it is possible that the trap is leaky or not present. The apparent seismic anomaly is probably caused by the relatively soft acoustic body consisting of clays, silts & fine sand sized grains. These sediments may be, or may have been, gas-bearing. However, the limited dataset which were acquired make it impossible to conclude with certainty.

Kroknes Lead

PL931 also includes the Oligocene Kroknes Lead, presented in Fig. 4.1, Fig. 4.2, Fig. 4.3 and Fig. 5.2. The Kroknes Lead is located stratigraphically below the Songesand Prospect, within the Hordaland Gp. The reservoir is interpreted to be an intrusive sand body within a complex network of injectites. The traps are

complex and difficult to define due to potential for high connectivity at sub-seismic scale. At these depths its likely that anomalous seismic behaviour should be associated with hydrocarbons. However, none are observed within the injectite complexes. The trap risk is considered too great to mature a drillable prospect.

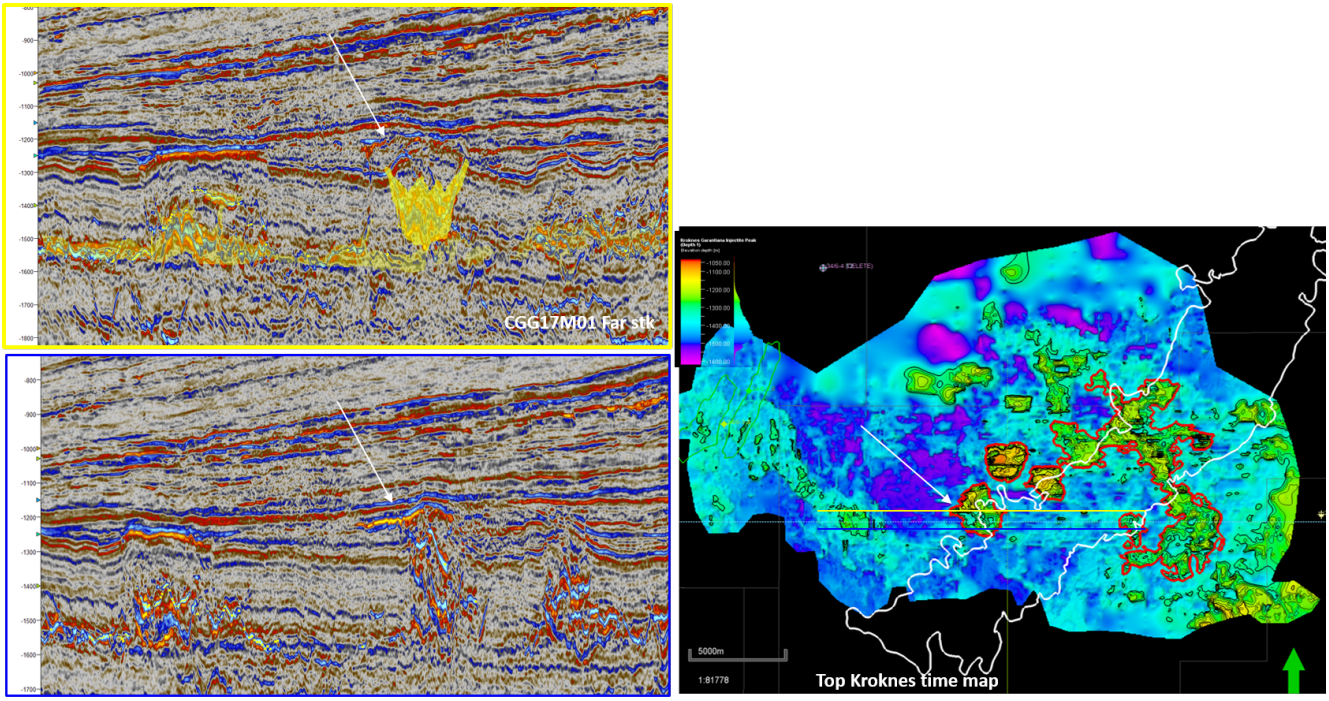

Fig. 5.2 Kroknes lead

6 Technical evaluation

Injectites of Eocene age are present over large areas in the license area, but the trap risk is considered too great because of how complex and difficult they are to define. There are no Paleocene or Cretaceous structural traps identified within license area, and the reservoir development is challenging. Pre Cretaceous structures are likely present, but the risk of producible reservoir facies are currently considered too high risk to mature a drillable prospect. After an extensive review of the prospectivity of the entire stratigraphic interval, it has been agreed by the Joint Venture to drop the licence.

7 Conclusion

No prospectivity with acceptable risk has been identified following the Songesand Well 35/4-2.

8 References

Applied Petroleum Technology AS, 2019. Geochemistry Data Report - Mud gas analysis, well 35/4-2.

EMGS, 2017. Wellesley CSEM sensitivity study.

Ichron, 2019. Biostratigraphy Songesand well 35/4-2, NOCS
Spectra Map, 2019.