

# Relinquishment report

PL 1069



# 1 License history

PL1069 was awarded as part of APA2019 on 14<sup>th</sup> of February 2020 to Lundin Norway AS (50% and operator) and AkerBP ASA (50%). The license is located in the northern Rås Basin in the Norwegian Sea, ca 40km west of the Victoria gas discovery. (Fig. 1.1). The license covers some 1500 km<sup>2</sup> and includes blocks 6505/6 & 9, 6506/1,4 & 7.

The work commitments comprised seismic reprocessing and G&G studies before a drill-or-drop within 2 years (14<sup>th</sup> February 2022).

The APA2019 application identified one main prospect named Vikna in addition to four leads, all reservoirised in Cretaceous Lysing Fm sandstones in structural/stratigraphic traps. The expected hydrocarbon fluid fill was oil.

The work commitments in the license have been fulfilled. Evaluation work through the licence period has downgraded the Vikna prospect and none of the leads have been de-risked sufficiently for a positive drill decision. The partnership has unanimously decided to relinquish the license.

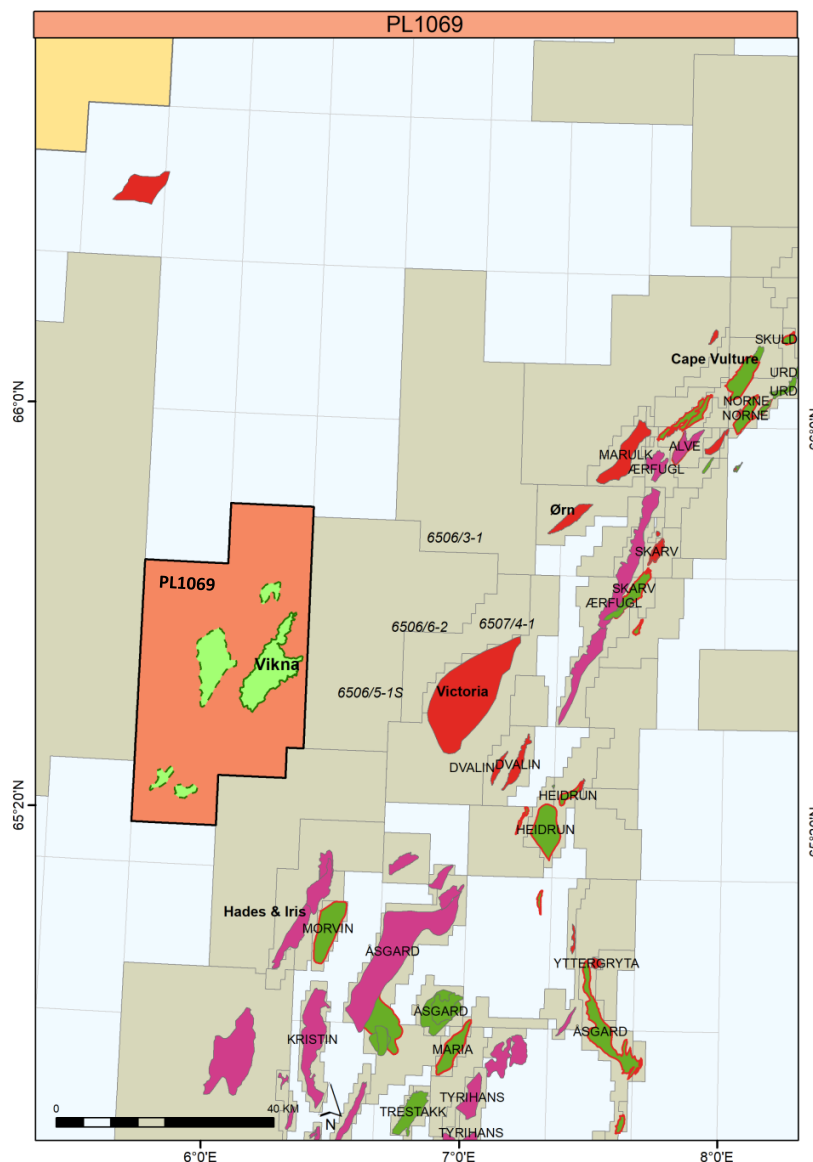


Fig. 1.1 PL1069 location map with the APA2019 prospectivity

License committee meetings held in the partnership are listed below in Table 1.1.

Table 1.1 License committee meetings

Committee	Date
MC/EC combined	23 <sup>rd</sup> April 2020
MC/EC combined	19 <sup>th</sup> November 2020
EC work meeting	9 <sup>th</sup> April 2021
MC/EC combined	16 <sup>th</sup> November 2021

## 2 Data base overview

### 2.1 Seismic data

The PL1069 seismic database comprises several 3D surveys; The main survey is BG07M01 which almost fully covers the PL1069 license area. The surveys to the east of the license were included in the database to provide ties to key nearby wells 6506/5-1S and 6506/3-1. The released full offset cubes were merged and reprocessed by Lundin and used as the license seismic database. This reprocessing fulfilled the seismic part of the work obligation for the licence.

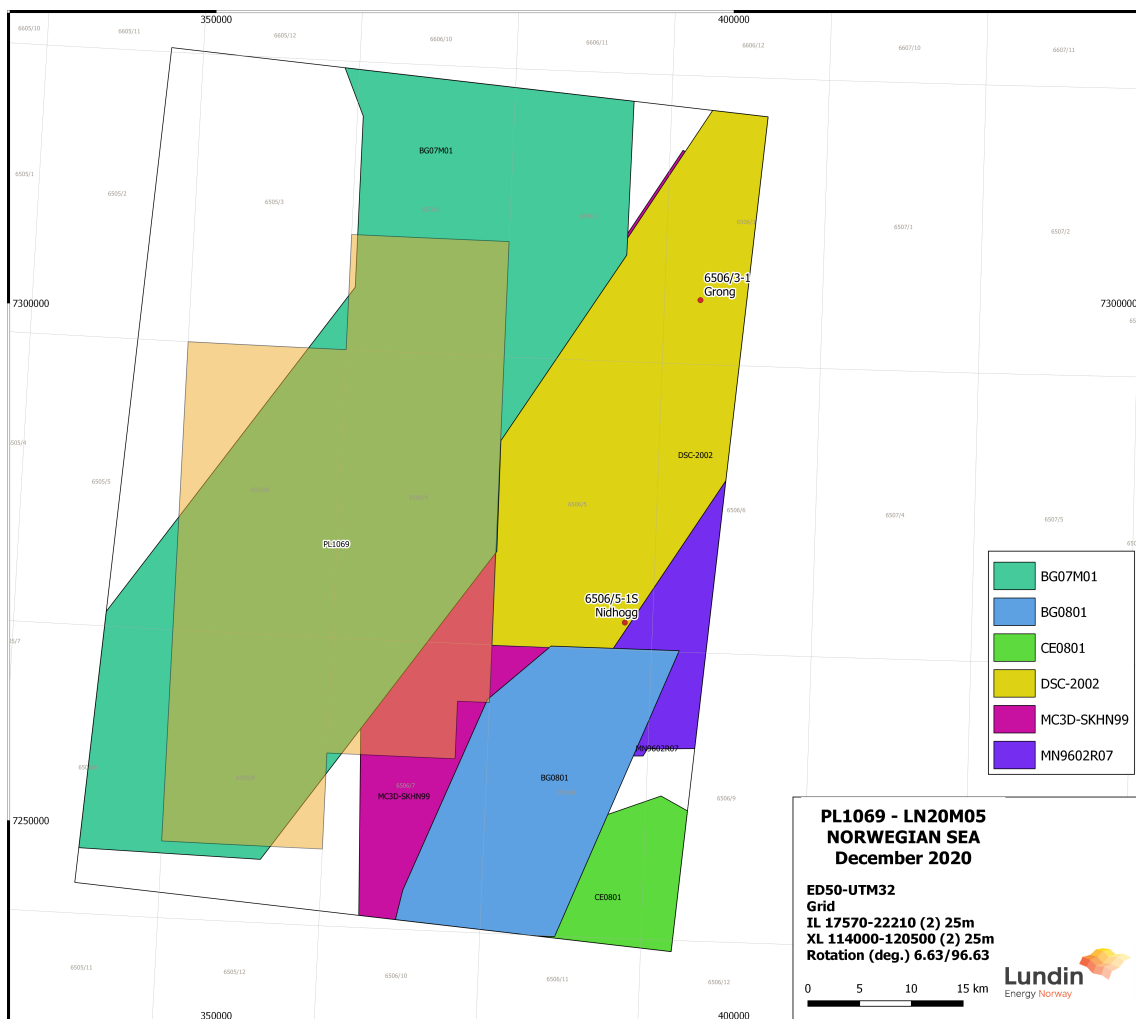


Fig. 2.1 PL1069 seismic database

## Seismic reprocessing

The surveys listed in the table below were post-stack reprocessed to improve imaging and seismic interpretability. Main focus was de-noising, guided by image structures along coherent energy. The noise model was handled separately in order to preserve seismic details and image faults. The de-noising add continuity to the data for improved interpretation and auto-tracking.

Table 2.1 PL1069 seismic database

Seismic survey	Owner	Area (sqkm)	Survey type	Market available	Multiclient	Processing year
LN20M05	PL1069	3702	Post-stack merge	No	No	2020
BG07M01	PGS	1985	Full offset released	Yes	Yes	2008
DSC-2002	PGS	790	Full offset released	Yes	Yes	2002
BG0801	SHELL	438	Full offset released	No	No	2009
CE0801	SPIRIT	129	Full offset released	No	No	2009
MN9602R07	TOTAL	114	Full offset released	No	No	2008
MC3D-SKHN99	PGS	246	Full offset released	Yes	Yes	1999

## 2.2 Well data

The well database is listed in Table 2.2. The wells have been used for seismic tie, correlation, reservoir property evaluation and petroleum system analysis.

Table 2.2 PL1069 well database

Wellbore	PL	Well name	Operator	TD in	Content	TD md	Year
6506/3-1	259	Sahara	Chevron	Late Cretaceous	Dry	3667	2001
6506/6-1	211	Victoria	Mobil	Early Jurassic	Gas	5491	2000
6506/6-2	513	Albert	Maersk	Early Cretaceous	Dry	3366	2013
6507/5-3	212	Ærfugl	BP Amoco	Early Cretaceous	Gas	3000	2000
6506/5-1 S	1008	Nidhogg	Aker BP	Late Cretaceous	Gas	3225	2020

## 3 Geological and geophysical studies

Several studies have been performed during the evaluation of the PL1069 license prospectivity:

- AVO and rock physics analysis/fluid substitution modelling**  
 The objective of this study was to investigate seismic amplitude response for Lysing sands with different hydrocarbon fluid pore fill scenarios in offset wells. Oil sands were found to be transparent to soft (AVO cl 2p-2), whereas gas sands were expected to be soft (AVO cl 2-3). A conclusion of the study was that the presence of seismic amplitude anomalies with depth conformance is to be expected for gas-filled Lysing Fm structures in the area. The search for such features was a key aspect of seismic evaluation of the reprocessed seismic across the Licence prospectivity, and the failure to find any was a significant impact.
- Petroleum system analysis**  
 New geochemical analysis of well samples were performed and a Cretaceous source rock study was utilized. A basin modelling study was performed in order to compare the basin configuration/burial history with other assumed kitchen areas along the western margin of the Halten/Dønna Terrace area. The focus of the work was to investigate the oil potential in the northern Rås Basin.
- Reservoir development**  
 Models for reservoir development within the license area were interpreted based on information from offset wells in the area, with support from seismic reflection signatures.

## 4 Prospect update report

The prospectivity identified in the APA2019 application comprised the Vikna prospect and four leads, all with Late Cretaceous Lysing Fm sandstones as target. The outline of the identified prospectivity at the time of the application is shown in Fig. 4.1 and the resource potential at that time is given in Table 4.1. The expected fluid phase at time of application was oil.

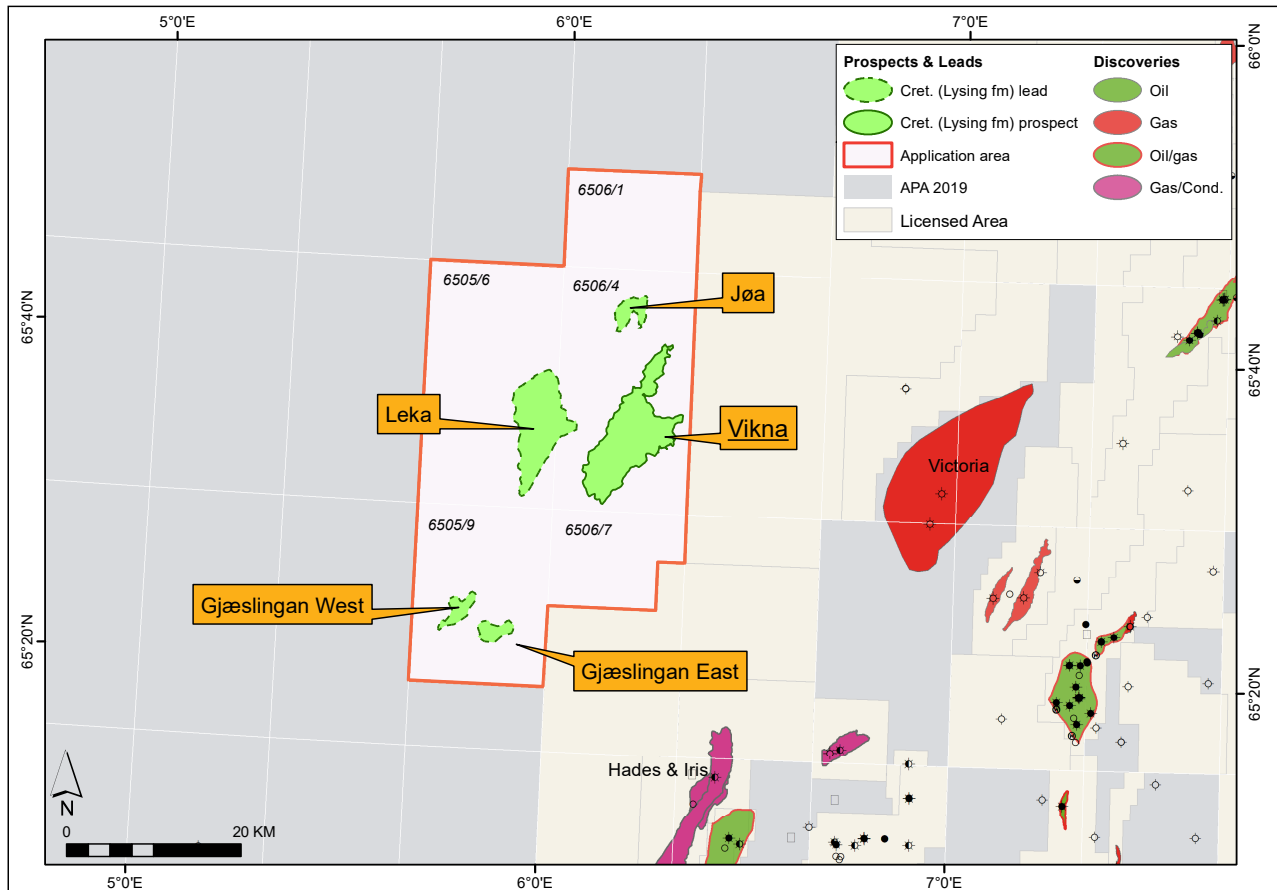


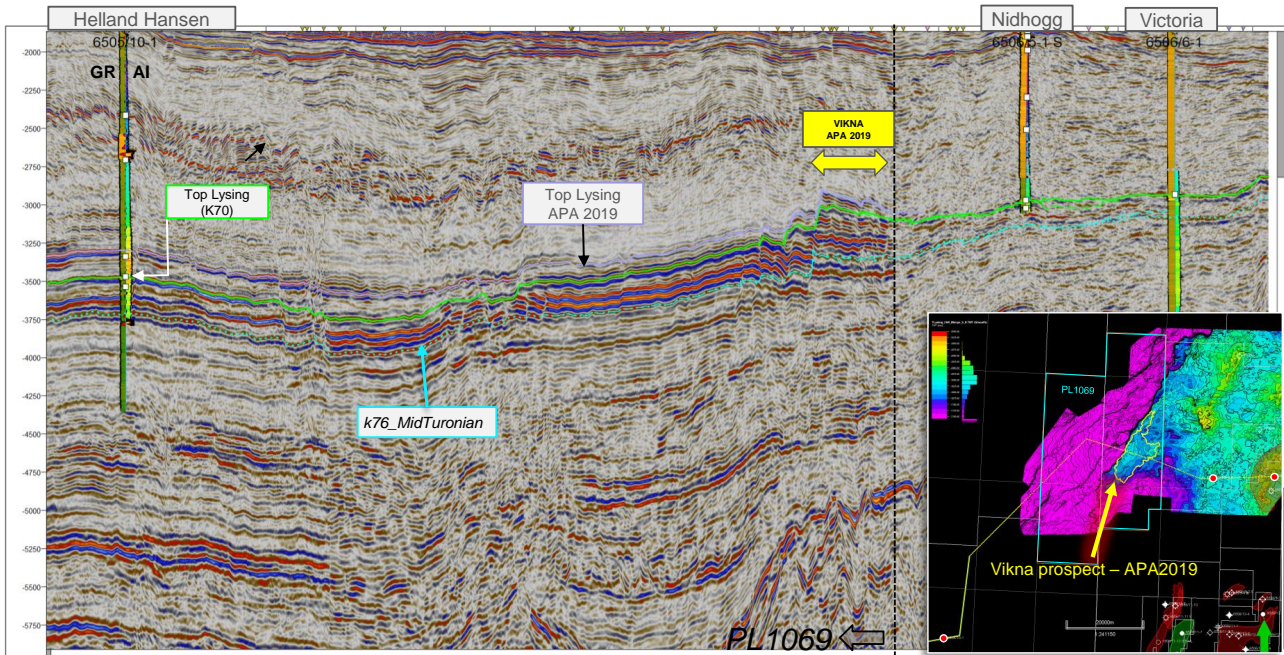
Fig. 4.1 The Vikna prospect and leads from the APA2019 application

Table 4.1 Resource potential at time of application - APA2019

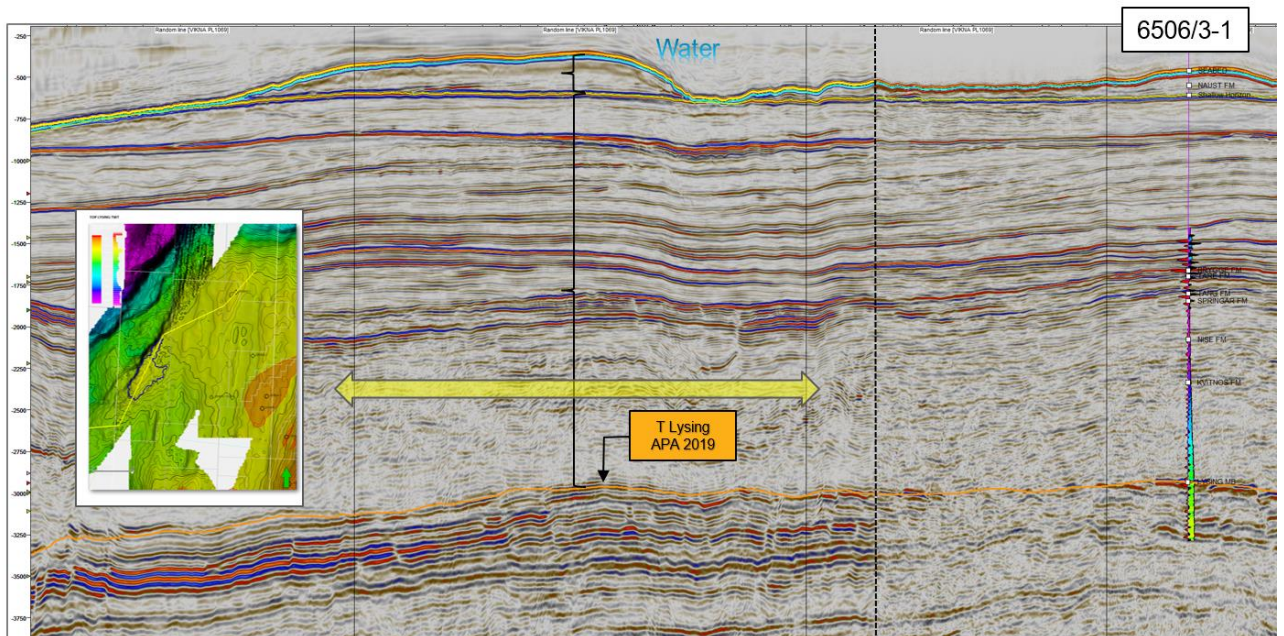
Discovery/ Prospect/ Lead name <sup>1</sup>	D/ P/ L <sup>2</sup>	Case (Oil/ Gas/ Oil&Gas) <sup>3</sup>	Unrisked recoverable resources <sup>4</sup>						Probability of discovery <sup>5</sup> (0.00 - 1.00)	Resources in acreage applied for [%] <sup>6</sup> (0.0 - 100.0)	Reservoir		Nearest relevant infrastructure <sup>8</sup>	
			Oil [ $10^6 \text{Sm}^3$ ] (>0.00)			Gas [ $10^9 \text{Sm}^3$ ] (>0.00)					Litho-/ Chrono- stratigraphic level <sup>7</sup>	Reservoir depth [m MSL] (>0)	Name	Km (>0)
			Low (P90)	Base (Mean)	High (P10)	Low (P90)	Base (Mean)	High (P10)						
Vikna	P		7,80	20,40	36,00	0,00	5,20	9,30	0,20	100,0	Lysing Mbr/Cretaceous	2974	Heidrun	55
Gjeslingan East	L	Oil	1,50	3,80	6,70	0,35	1,00	1,70	0,13	100,0	Lysing Mbr/Cretaceous	3190	Heidrun	55
Gjeslingan West	L	Oil	3,10	8,20	14,40	0,78	1,70	3,70	0,13	100,0	Lysing Mbr/Cretaceous	3175	Heidrun	55
Jøa	L	Oil	0,39	1,00	1,80				0,13	100,0	Lysing Mbr/Cretaceous	3285	Heidrun	55
Leka	L	Oil	12,10	30,60	53,00	3,00	7,90	14,10	0,13	100,0	Lysing Mbr/Cretaceous	3210	Heidrun	55

**Vikna prospect**

The Vikna prospect was identified in the APA2019 application as a 3-way dip/fault closure downflank and west of the Nidhogg prospect. The top Lysing Fm reservoir was picked on top of a downdip thickening reflective package (Fig. 4.2). The time-depth conversion was a critical factor for the definition of the trap as the spillpoint of the mapped closure (updip towards NE) was located below a seabed topographic feature that has significant impact on depth conversion lifting the spillpoint in depth compared to TWT imaging (Fig. 4.3).



**Fig. 4.2** Tie line Helland Hansen well - Vikna prospect - Nidhogg well



**Fig. 4.3** SW - NE line over the Vikna prospect from APA2019  
*Seabed topography influencing the time-depth conversion*

## 6506/5-1 S Nidhogg well result

The Nidhogg prospect comprised a 4-way dip closure with bright seismic amplitudes at the Lysing Fm level. The well was completed in March 2020 and encountered a 15 m gas column in Lysing Fm sandstones. The structure was apparently underfilled compared to the mapped spillpoint of the trap. The volume range from the NPD press release was 1 - 2.4 MSm<sup>3</sup> recoverable gas.

## PL1069 evaluation of the Vikna prospect

Seismic re-evaluation has been performed. Top Lysing reservoir was moved a bit deeper than in the APA2019 interpretation based on tie to well 6505/10-1 (Fig. 4.2). An updated and more detailed time-depth conversion was also performed, which significantly reduced the structural closure (and GRV and resource potential) within the Vikna prospect compared to APA2019 depth maps. This was a critical impact on the prospectivity of the licence. Closures over the leads identified in APA 2019 were also reduced.

The petroleum system analysis (PSA) study concluded that gas is the most common fluid in the discoveries nearby PL1069, and no evidence of oil shows were found in nearby wells. Key new well 6506/5-1S confirmed this. Gas is therefore considered to be the expected fluid phase in the license and geochemistry studies failed to de-risk oil charge to the license. This was also a critical impact to licence prospectivity.

From the AVO study performed for the license, seismic soft amplitude anomalies with depth conformance are expected for gas filled Lysing reservoirs. No evidence of such amplitude anomalies were identified on seismic in the license.

Based on the above, the Vikna prospect and the leads identified in the APA2019 application have been severely downgraded. The size of the Vikna closure has been reduced significantly, oil-charge is regarded as unlikely and no direct evidence for trapped gas is identified on seismic. The Vikna prospect has been removed from the prospect portfolio. The leads remain, but their chances-of-success have been reduced due to lack of seismic evidence for trapped hydrocarbons. No new resource calculation has been performed for the leads (Table 4.2).

**Table 4.2 Resource potential at time of relinquishment**

*The Vikna prospect has been severely downgraded and removed as a prospect. The remaining leads have been downgraded (lower POS) but no new resource calculation has been undertaken*

Discovery/ Prospect/ Lead name <sup>1</sup>	D/ P/ L <sup>2</sup>	Case (Oil/ Gas/ Oil&Gas) <sup>3</sup>	Unrisked recoverable resources <sup>4</sup>						Probability of discovery <sup>5</sup> (0.00 - 1.00)	Resources in acreage applied for [%] <sup>6</sup> (0.0 - 100.0)	Reservoir		Nearest relevant infrastructure <sup>8</sup>	
			Oil [10 <sup>6</sup> Sm <sup>3</sup> ] (>0.00)			Gas [10 <sup>9</sup> Sm <sup>3</sup> ] (>0.00)					Litho-/ Chrono- stratigraphic level <sup>7</sup>	Reservoir depth [m MSL] (>0)	Name	Km (>0)
			Low (P90)	Base (Mean)	High (P10)	Low (P90)	Base (Mean)	High (P10)						
Gjeslingan East	L	Oil							0,07	100,0	Lysing Mbr/Cretaceous	3190	Heidrun	55
Gjeslingan West	L	Oil							0,07	100,0	Lysing Mbr/Cretaceous	3175	Heidrun	55
Jøa	L	Oil							0,07	100,0	Lysing Mbr/Cretaceous	3285	Heidrun	55
Leka	L	Oil							0,02	100,0	Lysing Mbr/Cretaceous	3210	Heidrun	55

## 5 Technical evaluation

A technical evaluation with respect to economical value and possible development solution was not performed since no prospect remains within the license.

## 6 Conclusion

The work commitments in the license have been fulfilled. The re-interpretation of the seismic together with the G&G studies concluded that the Vikna prospect and the identified leads all have been severely downgraded.

There was no basis to support a positive drill decision in the PL1069 license and the partnership has agreed unanimously to relinquish PL1069 in January 2022.