



## **PL 857 – Licence status report**

---

## Summary

PL857 covers the Signalthorn Dome, a large structure considered during the 23rd Round to be prospective at multiple levels in the Jurassic, Triassic and Cretaceous. The structure has been tested by two wells, 7132/2-1 (Gjøkåsen) and 7132/2-2 (Gjøkåsen Deep). The wells proved Upper Permian and Upper Jurassic source rocks, and identified traces of migrated hydrocarbons. However, all prospects were dry. The licence commitment to drill a well to minimum depth of 3000 m MSL, has been fulfilled.

The remaining exploration potential in PL857 consists of two low-volume/high risk gas prospects in the Lower Triassic and Permian which do not warrant further exploration activity. As no drillable candidates have been identified and there are no other structures within the licence, the partnership has agreed to relinquish the licence.

**Table of contents**

**Contents**

<b>1</b>	<b>Licence history.....</b>	<b>4</b>
<b>2</b>	<b>Database overviews.....</b>	<b>5</b>
<b>2.1</b>	<b>Seismic data.....</b>	<b>5</b>
<b>2.2</b>	<b>Well data.....</b>	<b>5</b>
<b>3</b>	<b>Results of geological and geophysical studies.....</b>	<b>6</b>
<b>4</b>	<b>Prospect update report.....</b>	<b>8</b>
<b>5</b>	<b>Technical evaluation.....</b>	<b>10</b>
<b>6</b>	<b>Conclusion.....</b>	<b>10</b>
	<b>References.....</b>	<b>11</b>
	<b>Appendix.....</b>	<b>12</b>

## 1 Licence history

**Licence:** PL857 - blocks 7132/1, 7132/2, 7132/6, 7232/10, 7133/4 and part of blocks 7132/3, 7133/1

**Awarded:** June 10<sup>th</sup>, 2016

**Licence period:** Expires June 10<sup>th</sup>, 2020  
Initial period: 4 years

**Licence group:**

Equinor Enegy AS	40% (Operator)
Aker BP ASA	20%
Lundin Norway AS	20%
Petoro AS	20%

**Licence area:** 1943.818 km<sup>2</sup>

**Work program:** Drill an exploration well to a minimum depth of 3000 m MSL within June 10<sup>th</sup> 2020.

**Meetings held:**

06.09.2016	ECMC startup meeting	16.11.2018	ECMC meeting
22.09.2016	EC work meeting	25.01.2019	EC work meeting
17.11.2016	ECMC meeting	04.03.2019	EC work meeting
06.04.2017	EC work meeting	11.03.2019	EC work meeting
07.06.2017	EC work meeting	15.03.2019	EC work meeting
17.11.2017	ECMC meeting	25.09.2019	EC work meeting
16.02.2018	ECMC meeting	15.11.2019	ECMC meeting
09.04.2018	EC work meeting	30.01.2020	ECMC meeting
26.06.2018	ECMC meeting		

**Work performed:**

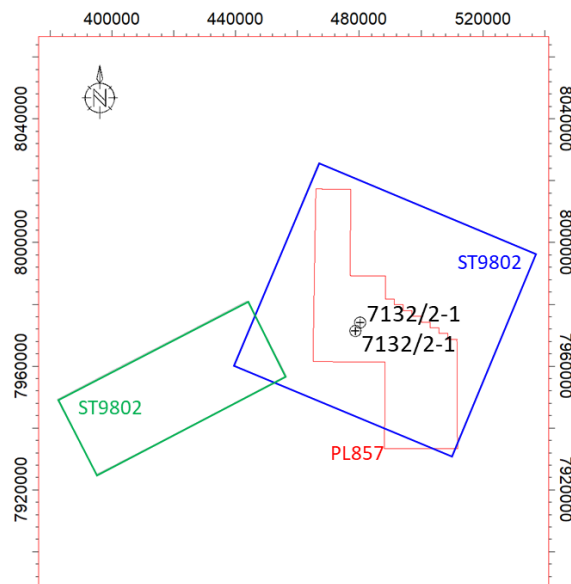
2016: Licence start-up.  
 2017: Wellplanning 7132/2-1 (Gjøkåsen)  
 2018: Wellplanning 7132/2-1 (Gjøkåsen) and 7132/2-2 (Gjøkåsen Deep)  
 2019: Drilling 7132/2-1 and 7132/2-2, postwell evaluation  
 2020: Decision made to surrender licence

**Reason for surrender:**

The exploration potential of PL857 has been evaluated on good quality, reprocessed PSDM seismic and tested by two exploration wells. All prospects have been proven dry. The undrilled Permian interval has a low volume/high risk potential for gas only that does not warrant further exploration. There are no remaining drillable prospects in the licence.

## 2 Database overviews

An overview of the seismic and well data used in the post-well evaluation of PL857 is shown in Figure 1.



**Figure 1 Seismic and well data used in the post-well evaluation of PL857**

### 2.1 Seismic data

PL857 is covered by the 3D broadband seismic survey ST14004 which was used for both wellplanning and post-well geophysical evaluation. The seismic quality is generally good. It is broadband processed (2 ms) which gives high resolution particularly in the shallow section. The licence is also covered by 3D-CSEM data that were reprocessed internally as 2015BSSE1504 prior to drilling. Survey ST9802 was used in the evaluation of the Lower Havert prospect. An overview of the seismic used in this status report is shown in Table 1.

**Table 1 Seismic surveys used in the post-drill evaluation of Gjøkåsen**

Seismic survey	Survey type	line/trace	Year	Quality
ST14004	3D	Full offset & angle stacks (near, SP mid, SP far and ultra-far)	2014	Good
ST9802	3D	Full offset	1998	Good

### 2.2 Well data

A list of wellbores included in this status report is shown in Table 2.

**Table 2 Wells used in the post-drill evaluation of Gjøkåsen**

Well	Wellname	NPDID
7132/2-1	Gjøkåsen	8629
7132/2-2	Gjøkåsen Deep	8638

### 3 Results of geological and geophysical studies

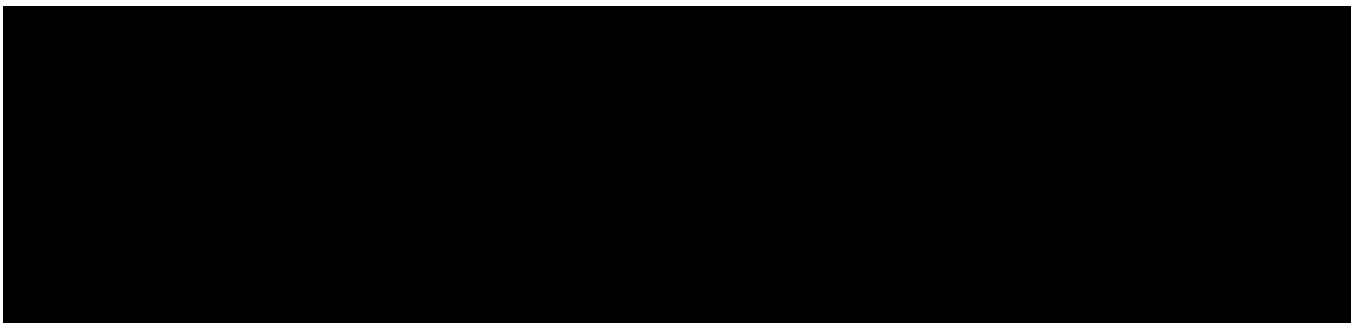
Wells 7132/2-1 and 7132/2-2 were drilled in 2019. A list of post-well studies is shown in Table 3.

**Table 3 Post-well studies in PL857**

Study	Documentation	Report
AVO & seismic welltie	Equinor 2019 <sup>1</sup> , Equinor 2019 <sup>2</sup>	Equinor 2019 <sup>1</sup> , Equinor 2019 <sup>2</sup>
Biostratigraphy	EC WM 25.09.2019, ECMC 15.11.2019	
Depth conversion	EC WM 25.09.2019	
Geochemistry	EC WM 25.09.2019, ECMC 15.11.2019	Equinor 2020 ( <i>in prep.</i> )
Sedimentology	EC WM 25.09.2019	
Image log interpretation	EC WM 25.09.2019	Eriksfjord 2019
Petrography, SEM	EC WM 25.09.2019, ECMC 15.11.2019; L2S 08.05.2020	
Petrophysics	EC WM 25.09.2019, ECMC 15.11.2019	Equinor 2019 <sup>3</sup> , Equinor 2019 <sup>4</sup>

#### Results: AVO and seismic welltie

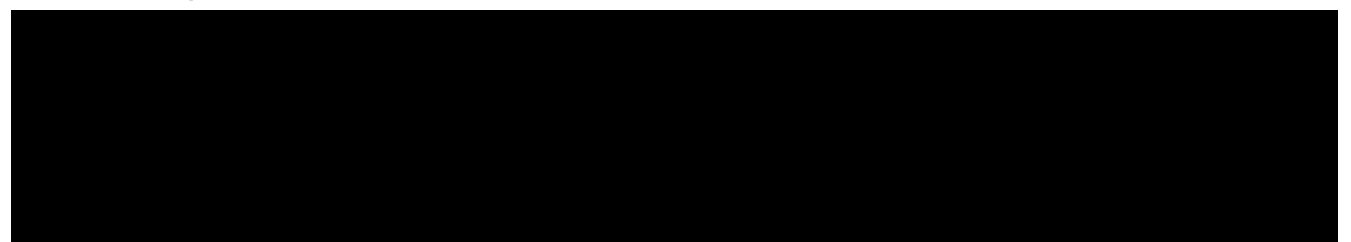
The seismic tie of Well 7132/2-1 to survey ST14004 is excellent, the apparent seismic resolution (time from central peak to side-lobe trough) of 8 ms giving small uncertainties in the picking of formation boundaries. The tie in 7132/2-2 is also good, with an apparent seismic resolution of 12 ms. The Stø and Nordmela formations are invisible in P-impedance and slightly hard in relative S-impedance. Sandstones in the Fruholmen, Snadd, Kobbe and Havert formations are soft in P-impedance; these are clearly imaged on seismic attribute extraction maps as channels. There are no seismic indications of hydrocarbons in the Triassic or Permian.



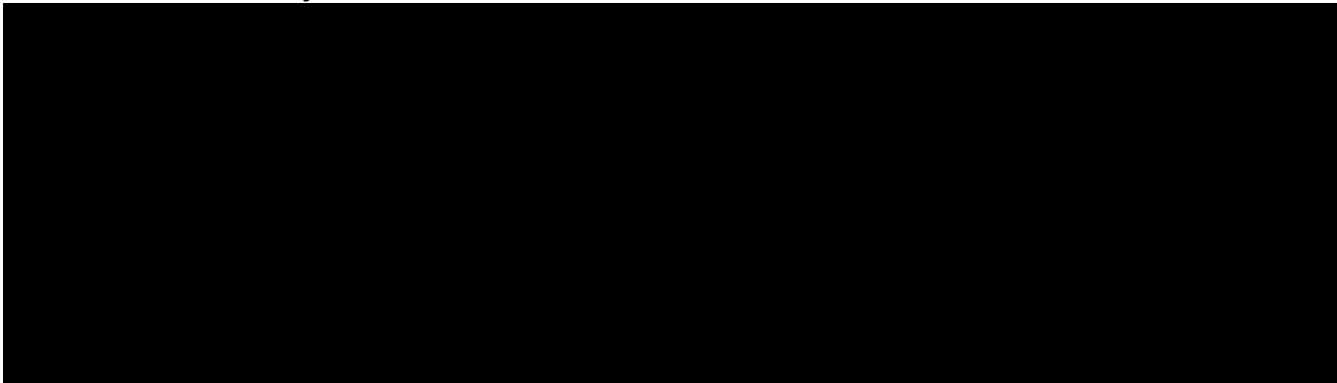
#### Results: Biostratigraphy

Unconformities are identified at the top of the Stø, Nordmela and Fruholmen formations. The absence of Tubåen Formation in the wells supports the pre-drill seismic mapping of a truncation line across the structure. Deposition of the Sassendalen Group was probably continuous. The Tempelfjorden Group is barren of *in-situ* microfossils.

#### Results: Depth conversion



## Results: Geochemistry



## Results: Sedimentology

Core in 7132/2-1 shows that the Stø Formation comprises upper shoreface sandstones overlying a ravinement surface at the top of the Nordmela Formation. The Nordmela Formation consists of delta plain and stacked fluvial channels. The image log indicates that part of the Nordmela Formation was washed-out during coring. The lowermost part of the core consists of mouth bar and bay-fill sediments of the Fruholmen Formation.

## Results: Image log interpretation

The wells verify the regional sedimentological understanding of Triassic in this area. Sandstones of the Fruholmen Formation represent a tidal channel complex overlying a muddy tidal plain, while the upper part of the Snadd Formation represents a tidally-influenced alluvial plain. The Havert Formation comprises a thick sequence of delta plain sediments. The maximum horizontal stress orientation in the wells (SHmax WNW-ESE) is significantly different from orientations obtained in the western Barents Sea (SHmax mainly NNW-SSE).

## Results: Petrography

The Stø Formation has excellent reservoir properties. The Nordmela Formation is more variable, while the Fruholmen Formation is generally poorer. The feldspar fraction in these sandstones is dominated by K-feldspar which is typical of a Fennoscandian provenance. Early stage quartz overgrowths indicate burial to a maximum of ca. 2200 m. Sandstones in the Havert Formation are more variably sorted, with a characteristically high clay content and a predominance of plagioclase in the feldspar fraction that suggests an Uralian provenance. The low permeability of these sands is attributed to their high detrital clay content and the presence of calcite cement. The Late Permian Røye Formation consists of microcrystalline argillaceous carbonates with no reservoir potential. Residual hydrocarbons are identified in the Nordmela Formation (Appendix 1).

## Results: Petrophysics

The wells encountered porosities approximately as prognosed. This broadly verifies the pre-drill estimate of ca. 1600 m of Cenozoic uplift and erosion.

## Results: pressure

Pressure data in 7132/2-1 indicate the Realgrunnen Subgroup and Snadd Fm share a common water gradient. Data in 7132/2-2 show the Havert Formation is underpressured by 7-10 bars. The occurrence of 'steps' in the Havert pressure gradient indicates that at least some of the channels are locally sealed within the encasing delta plain sediments. Pressure points were not acquired in the overlying Klappmyss or Kobbe formations; it is therefore uncertain which of these are forming a regional seal.

## 4 Prospect update report

The Signalhorn Dome is situated at the southern margin of the Tiddlybank Basin and was considered well-placed to trap any hydrocarbons migrating from the kitchen (Statoil 2016). All prospects have been proven dry. A summary of the drilled prospects is presented in Table 4.

[Redacted content]

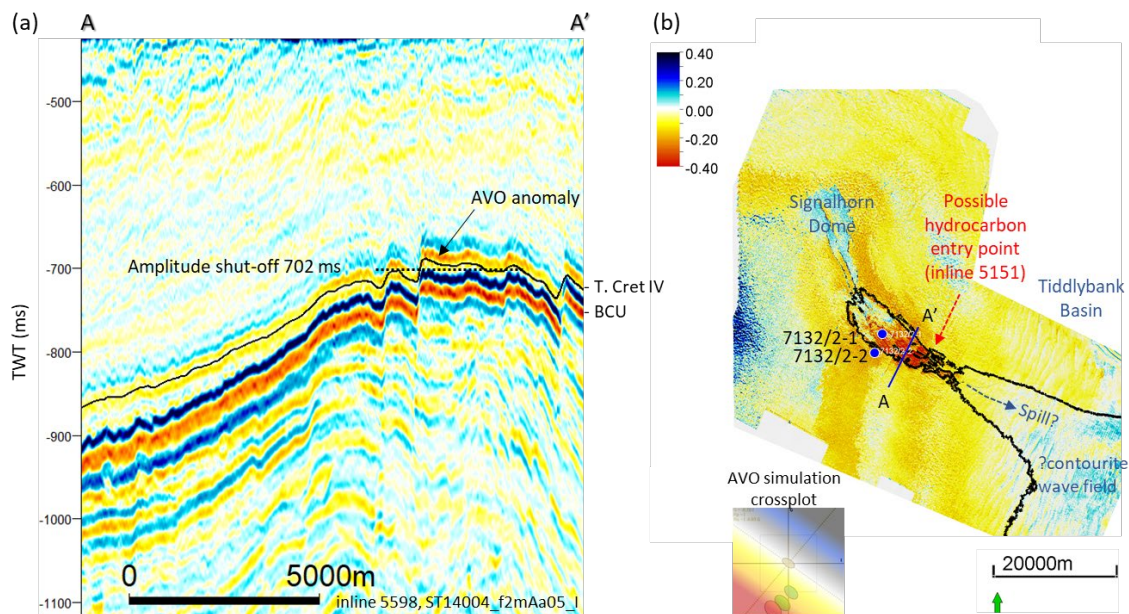


Figure 2 Hydrocarbon AVO anomaly (a) inline 5598 (b) horizon extraction 10 ms above Top Cretaceous IV

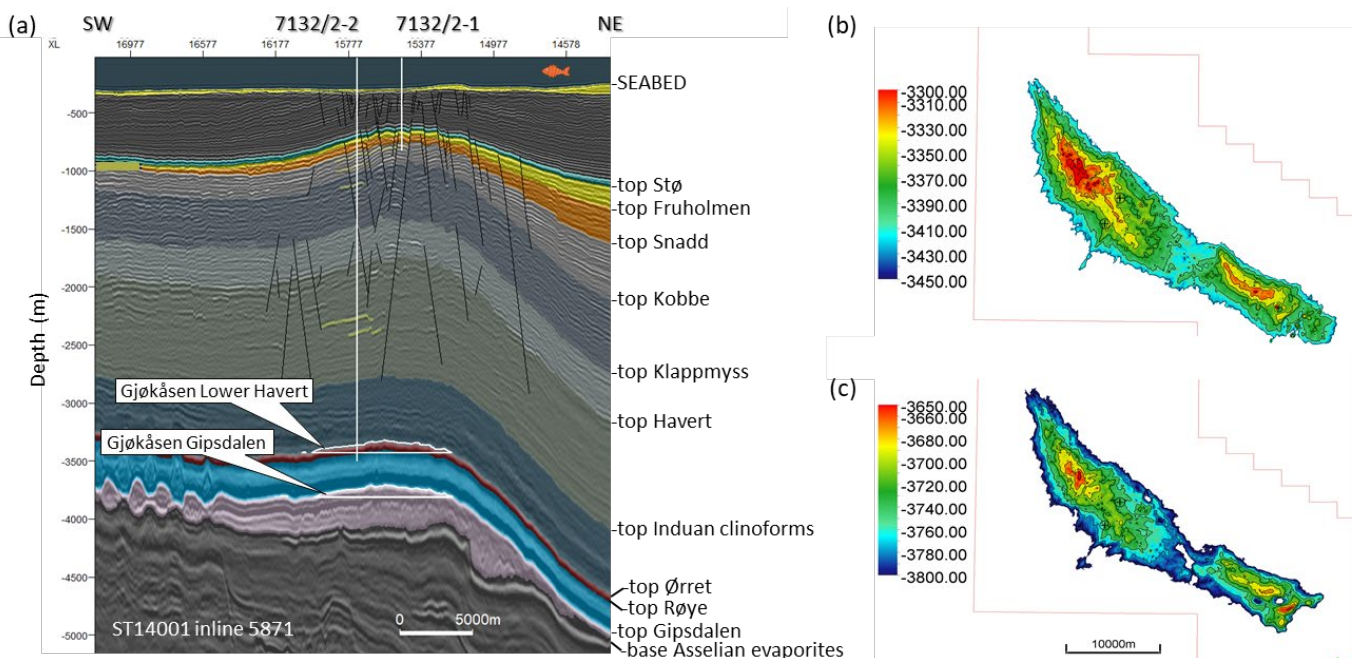
Table 4 Summary of prospects drilled in PL857

[Redacted content]



\*Segment B

Well 7132/2-1 was positioned high on the structure to test the main prospect (Stø and Nordmela/Tubåen fms). Well 7132/2 was positioned down-flank to test secondary prospects in the Triassic (Figure 3). Well 7132/2-2 was drilled almost 500 m beyond the licence commitment depth of 3000 m to gain stratigraphic control of the Induan clinoform sequence, and to identify the source of the large gas peak at 3400 m MD in the Lower Havert Formation.



**Figure 3 (a) Geoseismic section and depth maps of (b) Lower Havert prospect and (c) Gipsdalen prospect**

Two new prospects are assessed as part of the post-well evaluation: Gjøkåsen Lower Havert and Gjøkåsen Gipsdalen. Both are low-confidence prospects with low volume potential and high risk (Table 5 and Table 6). The potential is for gas only. No other prospects are identified in the licence.

### ***Gjøkåsen Lower Havert prospect***

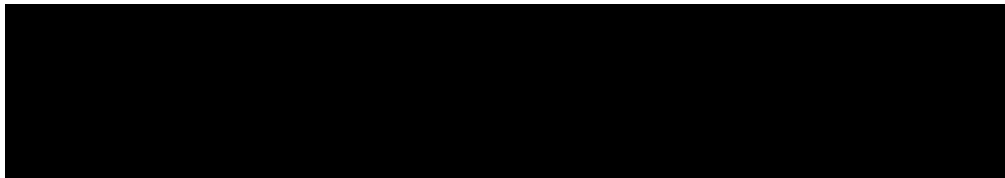
A 52% gas peak was recorded in Well 7132/2-2 at 3400 m MD. No flow into the well was recorded. Equinor's view is that the gas most likely represents bleed-off from a fracture connected to the underlying Ørret source rock. However, as the gas zone was cemented during well operations and wireline log data could not be acquired from this interval in the 8 1/2" hole section, the issue remains unresolved. To ensure the remaining exploration potential is fully assessed, a prospect evaluation is made which assumes the gas peak could represent an interval of tight reservoir. The concept is supported by seismic evidence of fan channels in the basal part of the Havert Formation west of Gjøkåsen, and by the occurrence of intra-Ørret sandstones in several wells (Statoil 2016). The presence of reservoir in Gjøkåsen is speculative as cuttings and log data are missing from an interval of approximately 10 m at

the base of the 8 ½" hole section (Equinor 2019<sup>2</sup>). The cuttings were lost as a result of circulating gas through the choke. Reference is made to ECMC meeting 30.01.2020 for a detailed documentation of the prospect.

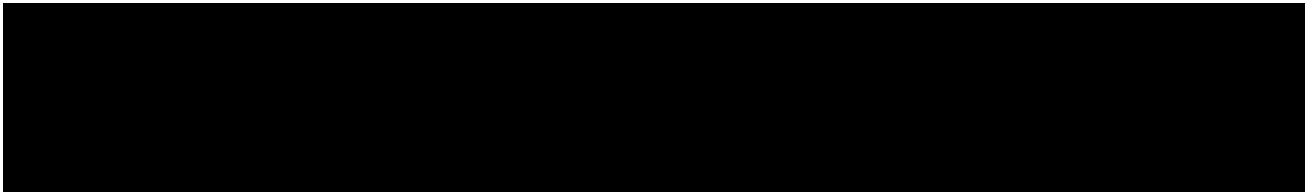
**Gjøkåsen Gipsdalen prospect**

The Gipsdalen Group is seismically analogous to Well 7228/9-1S (Alfa) in the Nordkapp Basin. Well 7228/9-1S proved a low net-to-gross sequence of thin basinal carbonates within a thick evaporite sequence. Maximum burial depths of over 5000 m in Gjøkåsen indicate that carbonate reservoir quality is most likely poor. The general lack of image log fractures in the lowermost part of 7132/2-2 suggests that reservoir properties in the Lower Havert and Gipsdalen prospects are unlikely to be significantly enhanced by fracturing. The Gipsdalen Group was not penetrated by the well. For detailed documentation of the prospect evaluation, reference is made to ECMC meeting 30.01.2020.


**Table 5 PL857 prospect volume and risk**



**Table 6 PL857 prospect risk elements**



## 5 Technical evaluation

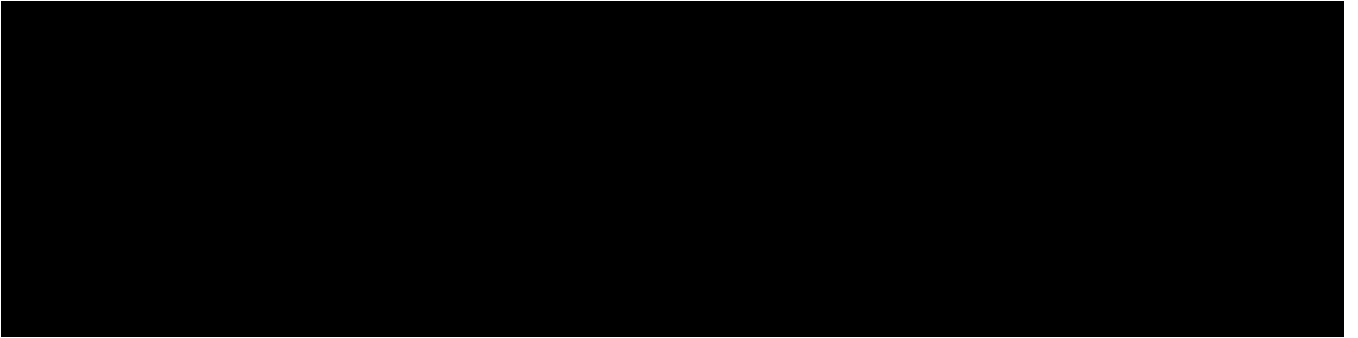
The remaining prospects in PL857 have poor reservoir quality and low volume potential. The commercial threshold for gas in this part of the Barents Sea is . Given that the P10 volumes are far below the threshold for any commercial interest in this area, no business case has been made.

## 6 Conclusion

The Gjøkåsen structure has been tested by two wells, 7132/2-1 (Gjøkåsen) and 7132/2-2 (Gjøkåsen Deep). Both wells were dry. Two new prospects in the Lower Triassic and Upper Permian have been evaluated, with gas volumes too small and/or high risk to be of commercial interest. The licence commitment to drill a well to minimum depth of 3000 m MSL has been fulfilled. No other drillable prospects are identified. The partnership has therefore agreed to relinquish the licence.

---

## References



Doc. No.

2020-001121

Valid from: 10.09.2020

Rev. no.

---

## Appendix

