



**NORGE**  
MEMBER OF MOL GROUP

## **PL 905 Relinquishment Report**

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## 1 History of the Production License

PL 905 was awarded 02.03.2018 to MOL Norge AS as operator with 50% interest and OMV as partner with 50% interest. The area comprises parts of blocks 2/2 and 2/5.

### Work commitment

1. The licensees shall acquire 3D seismic within 2 years (by March 2<sup>nd</sup> 2020)
2. The Licensees shall make a Drill or Drop decision within 2 years (by March 2<sup>nd</sup> 2020)

The Licensees has fulfilled the work program and decided not to drill an exploration well, the License is therefore relinquished after 2 years.

An overview of held License meetings is given in Table 1.1.

**Table 1.1 Licence Meetings**

Type of meeting	Date for meeting
MC meeting no.1	24.04.2018
EC/MC meeting no.2	15.11.2018
Work meeting	26.09.2019
Work meeting	30.09.2019
EC/MC meeting no.3	27.11.2019

### Reason for relinquishment

The Upper Jurassic shoreface and turbidite prospects defined in the APA2017 application were downgraded after license studies and G&G work indicating high reservoir presence risk. The Ula Formation shoreface sands are most likely restricted to the first terrace related to the main boundary, the Coffe Soil Fault. The presence of these sands within PL905 is therefore associated with very high risk.

The Kark well drilled in 2019 (2/1-17S), found 6 meters of oil filled turbidite sandstone assigned to the Eldfisk Formation. These turbidites are interpreted to be sourced from the west (as for well 2/1-5). If the turbidites reach further east into PL905, they are most likely very thin and not of commercial interest.

A new prospect was defined with reservoir within the lowermost Upper Jurassic Basal sandstone. The prospect is a 4-way dip trap defined upflank of well 2/2-3, where the thickness of the Basal sandstone is mapped to increase. High risk is associated with both reservoir and source rock quality, making the overall risk too high for a well decision to be made.

## 2 Database Overview

### 2.1 Seismic Database

The license common database covers broadband PGS 3D GeoStreamer data within PL905 license only; PGS16M02\_PGS1908CGR and MC3D-CGR15M. Fig. 2.1 and Table 2.1 shows seismic data available to MOL and used in the regional evaluation of the PL905 area.

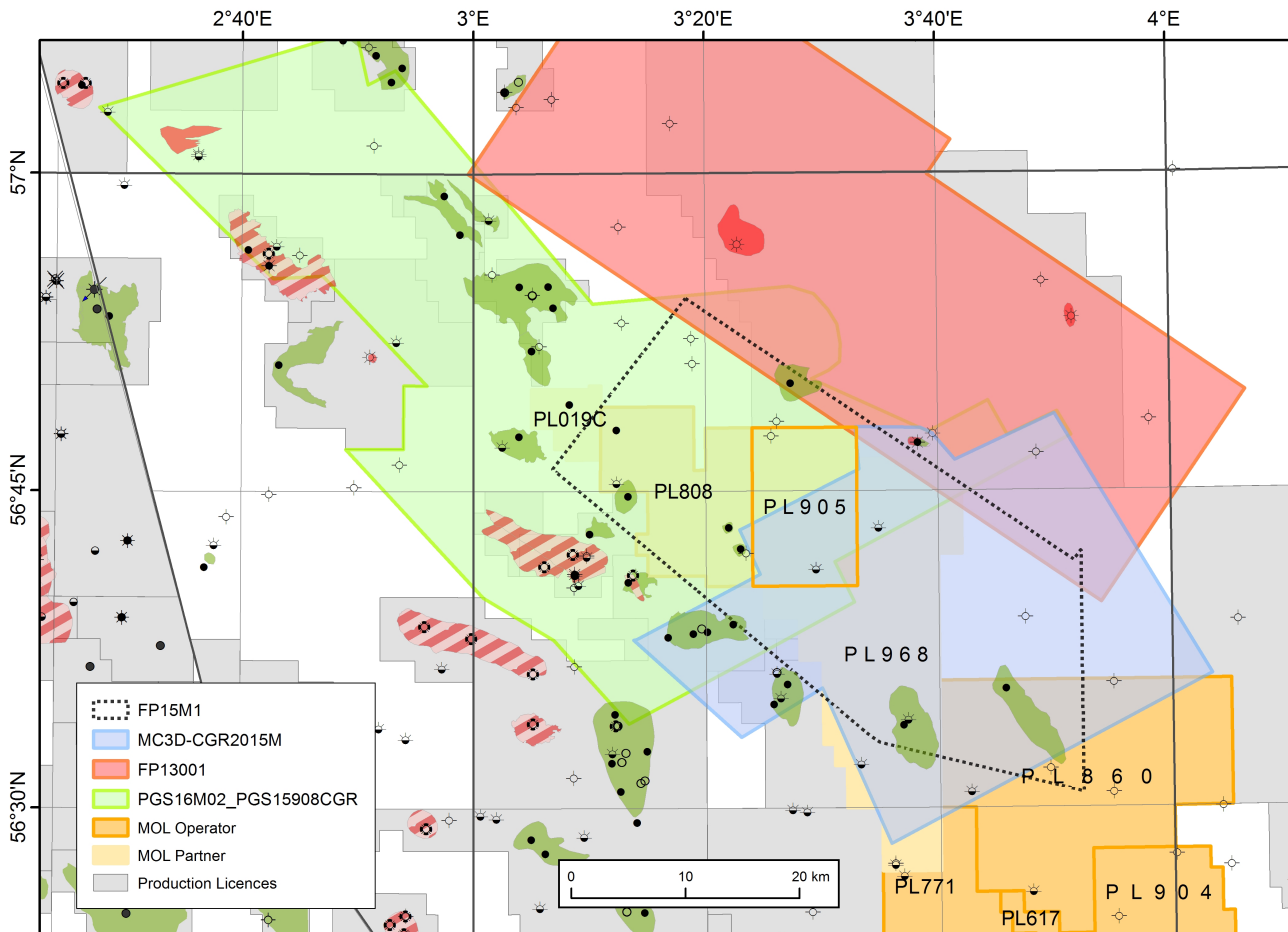


Fig. 2.1 Seismic Data Base

Table 2.1 PL905 Seismic data Base

Seismic 3D surveys	Vintage	Survey Type	NPDID
PGS16M02_PGS15908CGR	2015-2016	Broadband	
MC3D-CGR15M	2015	Broadband	
FP13001	2013	Conventional	7849
FP15M1	2015	Conventional	

The APA2017 evaluation was based on the conventional FP15M1 3D seismic survey which is a PSDM reprocessed merge of several public surveys. The PL905 evaluation is based upon broadband PGS Geostreamer 3D seismic data, acquired by the licensees according to the license work program.

## 2.2 Well Database

All released wells in the area have been used in the evaluation of the license. Table 2.2 lists the main wells included in the common data base. Well 2/1-17S (2019) has not been available to partner, only information from the press release is included.

Table 2.2 Common Well Data Base

<b>NPDID</b>	<b>Well</b>	<b>Key well</b>	<b>Description</b>
249	2/1-1		
3648	2/1-12		
7180	2/1-16S	X	Shallow marine Upper Jurassic sandstone
8851	2/1-17S	Press Release	Turbidite Upper Jurassic sandstone
63	2/1-5	X	Turbidite Upper Jurassic sandstone
1667	2/1-9	X	Upper Jurassic shallow marine and possibly turbidite sandstone
46	2/2-1	X	Shallow marine Upper Jurassic sandstone
3	2/2-3	X	Basal sandstone
1188	2/2-4	X	Shallow marine Upper Jurassic sandstone and Basal sandstone
1846	2/2-5	X	Shallow marine Upper Jurassic sandstone
6346	2/2-6		
162	2/3-1		
198	2/3-3		
129	2/3-4	X	Shallow marine Upper Jurassic sandstone and Basal sandstone
1956	2/4-16R		
1792	2/4-17	X	Basal sandstone
2253	2/4-18R	X	Turbidite Upper Jurassic sandstone
5556	2/4-20	X	Basal sandstone
6736	2/4-21	X	Turbidite Upper Jurassic sandstone
6933	2/4-21A	X	Turbidite Upper Jurassic sandstone
7535	2/4-22S	X	Basal sandstone
7657	2/4-23S		
178	2/5-1		
2044	2/5-10	X	Basal sandstone
2194	2/5-10A	X	Basal sandstone
4433	2/5-12		
5948	2/5-13		
261	2/5-6		
25	2/5-7	X	Possible shallow marine Upper Jurassic sandstone
1834	2/5-9		
1527	2/6-4S		
2885	2/6-5		

### 3 Results from Geological and Geophysical Studies

Table 3.1 shows the geological and geophysical studies with main results performed by the PL 905 license.

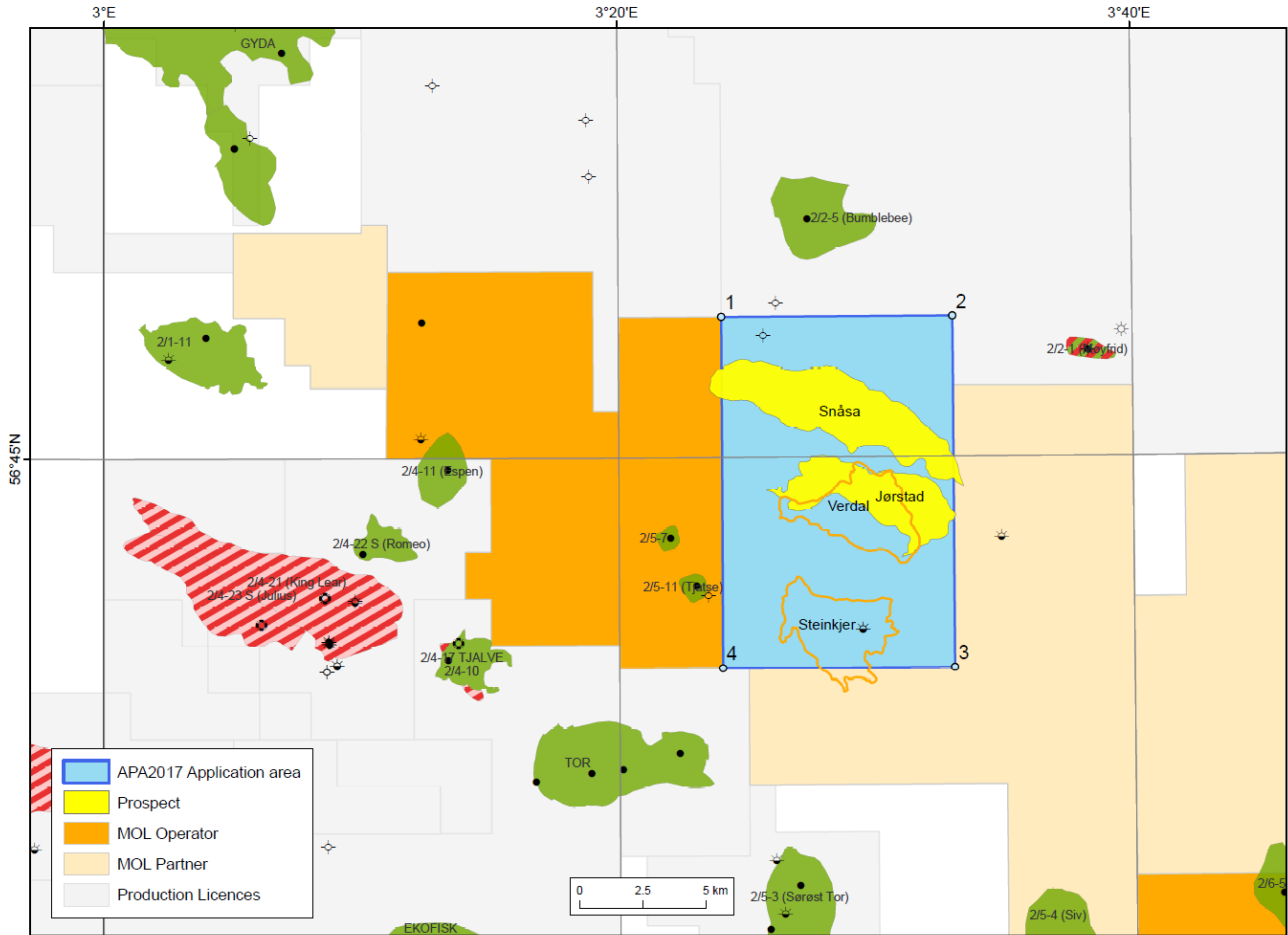
**Table 3.1 Studies Performed**

Studies Performed	Vendor	Aim of study	Result
Structural Reconstruction	Petex	Sequentially restore the validated 2D seismic interpretations to understand the timing and development of mini basins and determine the distribution of paleo-highs	Fault geometries and salt distribution were validated and adjusted accordingly. The development of the mini basins are all strongly dependant upon the input seismic interpretation
Quemscan Provenance study	Rocktype	Reduce reservoir presence and quality risk	The study gave important input to the final GDE maps
Biostratigraphy, core description, Paleo water depth mapping	RPS	Reduce reservoir presence and quality risk	GDE maps were produced for Upper Jurassic reservoir levels. These GDE maps were used as input to MOL's inhouse work to understand the reservoir development in the license area
Upper Jurassic stratigraphy study	Inhouse	Correlation of wells to improve well tie to seismic and provide input to the geological models	Several wells were re-interpreted and updated Intra Jurassic well tops were used in the seismic mapping. Particularly the correlation of the Haugesund Formation and the Basal sandstone were much improved. This work strongly influenced the understanding of the Upper Jurassic reservoir and source rock distributions in the license area
Regional mapping & depth conversion	Inhouse	Regional understanding	Regional time and depth maps on major horizons, velocity model for depth conversion
Detailed prospect mapping, depth conversion and prospect evaluation	Inhouse	Define and evaluate prospectivity	APA 2017 Upper Jurassic shallow marine and deep marine turbidite prospectivity was downgraded due to high reservoir presence risk. A new Oxfordian Basal sandstone prospect was defined
Basin Modelling Study	Inhouse	Generate a petroleum system model based on source rock analysis and detailed basin mapping	The generated petroleum system model shows that pending upon source rock quality and thickness, timing and migration into the defined prospect may be favourable

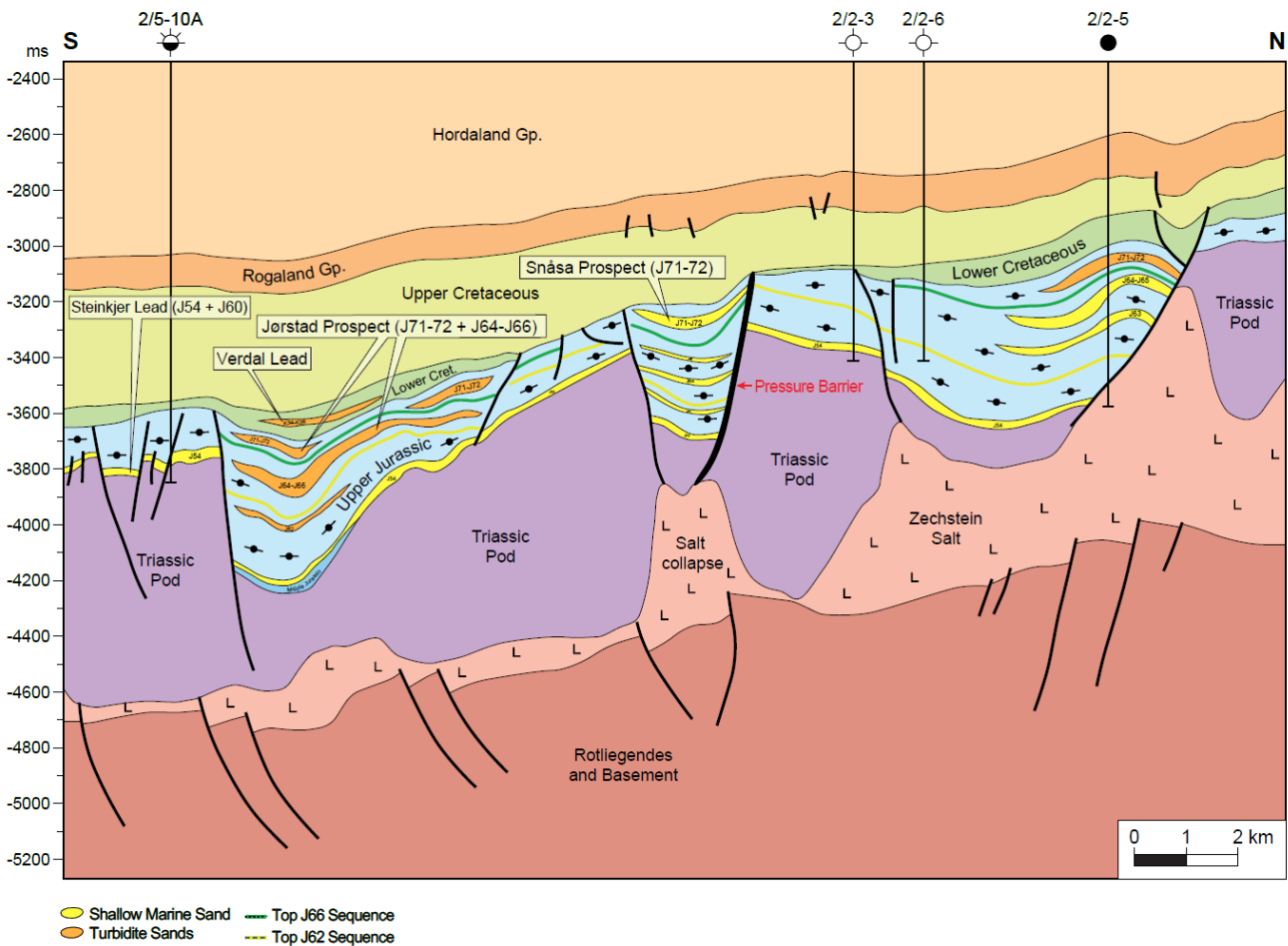
## 4 Prospect Update

### Evaluation of APA2017 Snåsa and Jørstad Prospects

Fig. 4.1 shows the prospect map from the APA2017 application, a seismic geosection showing the play models are shown in Fig. 4.2.



**Fig. 4.1 APA2017 Prospects and Leads**



**Fig. 4.2** Geosection through the APA2017 prospects and Leads

Two prospects, Jørstad and Snåsa, and two leads, Steinkjer and Verdal were identified. Upper Jurassic, shallow marine sands belonging to the Ula Formation were the reservoir target for the Snåsa Prospect while the Jørstad Prospect had reservoir target within Upper Jurassic turbidite sandstones. Both prospects were defined as stratigraphic traps as shown by the geosection in Fig. 4.2.

The Steinkjer and Verdal leads had reservoir targets within the Basal sandstone and the Cretaceous Ran Formation accordingly, none of the leads were matured into prospects. A new Basal sandstone prospect was later defined updip of the 2/2-3 well, see Fig. 4.2 .

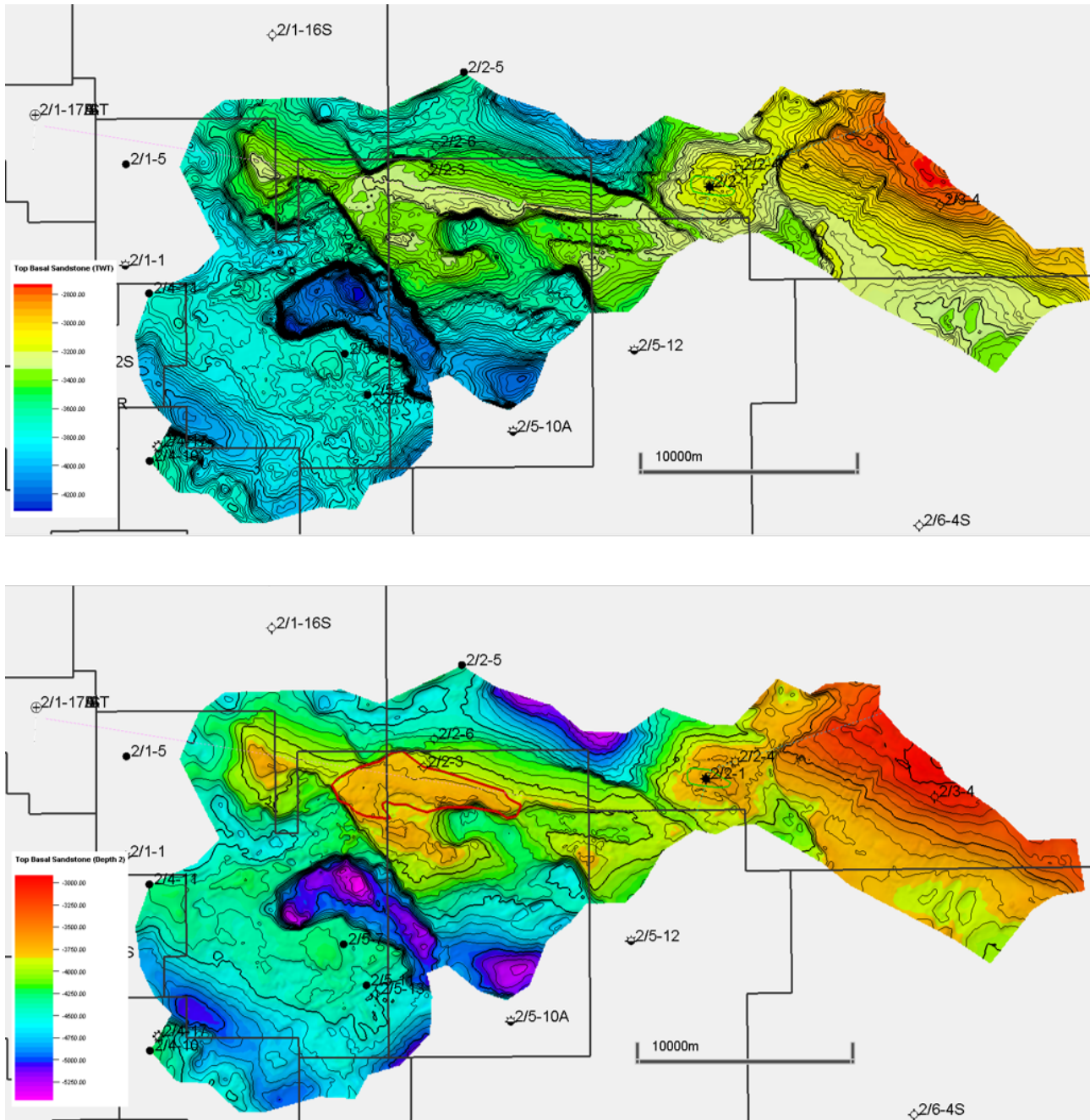
Results from the studies and G&G work performed by the license (Table 3.1), conclude that the shallow marine Ula Formation sandstones are trapped in front of the main boundary fault, the Coffe Soil Fault. The sands are not likely to reach as far south as the Snåsa prospect in PL905, the Snåsa Prospect was therefore downgraded due to the high reservoir presence risk.

Results from the provenance- and sedimentology studies show that there are two major Upper Jurassic gravity flow systems recognized in the area, both sourced from the NW. The penetrated sands, west of PL905, are very thin (maximum 6 m) and cannot be mapped with any confidence. It is considered unlikely that any turbidite reservoir sands present in PL905 will be of commercial interest. The Jørstad Prospect was therefore downgraded due to high reservoir presence risk.

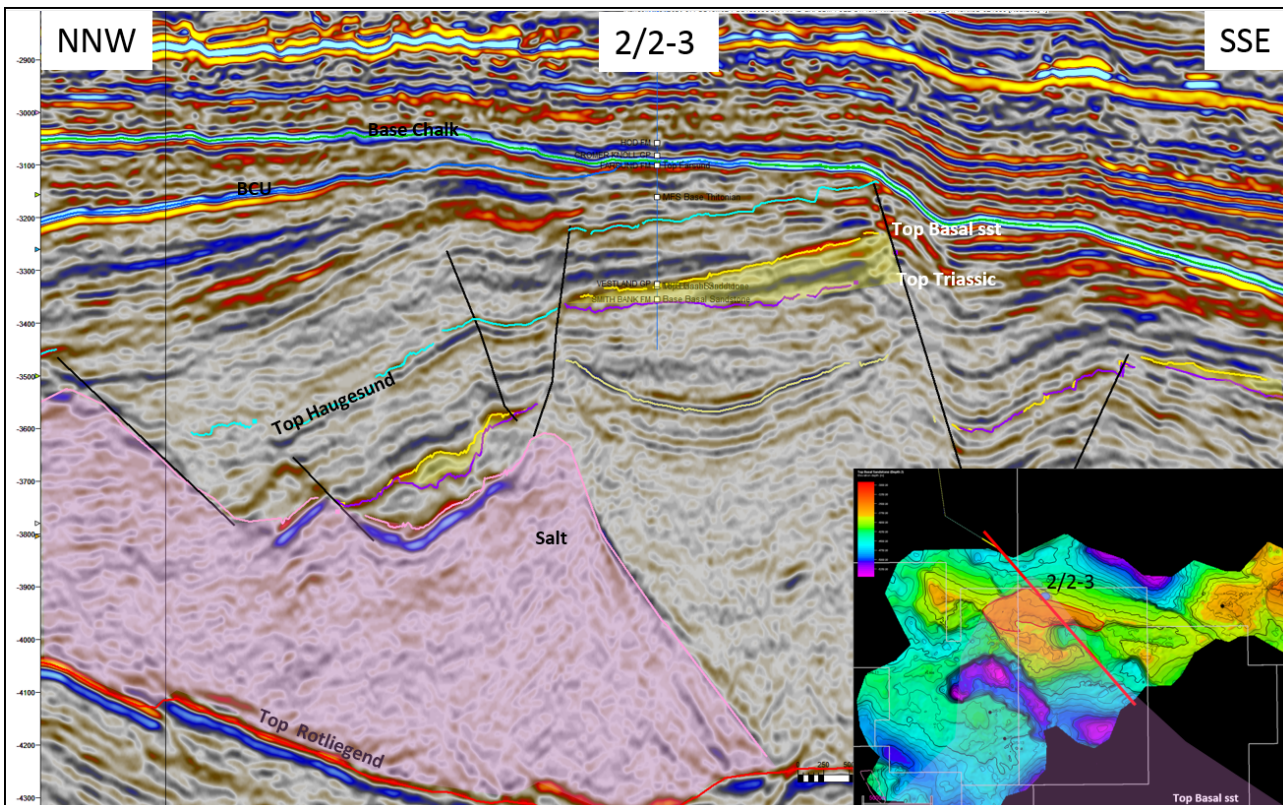
### Evaluation of the Basal sandstone Prospect

The Basal sandstone Prospect is defined upflank of the 2/2-3 well within a 4-way dip closure. The prospect is defined based on a mapped increase in the thickness of the Basal sandstone interval away from the 2/2-3 well.

Top Basal sandstone time and depth maps are shown in Fig. 4.3 and a seismic line with tie to the 2/2-3 well is shown in Fig. 4.4.



**Fig. 4.3 Top Basal sandstone time (upper) and depth maps** The structural closure in time is shown in light green. On the depth map (lower) the orange colour shows the structures upflank of the 2/2-3 well. Parts of the structural closure upflank of the 2/2-3 well is interpreted to have none or very thin reservoir, the volumetrics only include the area limited by the red polygon.



**Fig. 4.4** Seismic section with tie to the 2/2-3 well The Basal sandstone Prospect is defined upflank of the dry well 2/2-3

The 2/2-3 well is located within the 4-way dip structural closure in depth, however on the time maps the well is located outside of the structural closure. Some uncertainty is related to the depth conversion.

Since the Basal sandstone penetrated by the 2/2-3 well is tight, the prospect is depending on better reservoir facies in the updip section. A few fluid inclusions were found in the 2/2-3 well, however too subtle to conclude that considerable migration has taken place into the prospect. The Basal sandstone Prospect was concluded to have too high reservoir and source risks to be a drilling candidate.

The Basal sandstone Prospect has a recoverable resource potential of 4 - 22 MSm<sup>3</sup> of oil. 73% of the prospect is located within PL905, 27% is located within PL808. The prospect's geological chance of success is estimated to 14%.

## 5 Technical Evaluation

The only remaining prospect in the license is the Basal sandstone Prospect.

To mature the Basal sandstone Prospect into a drillable prospect, the reservoir- and source rock quality risks have to be reduced.

Increased seismic resolution through reprocessing of existing broadband 3D data, or new seismic acquisition, may give a higher confidence in the reservoir presence. A detailed sedimentology study with focus on diagenesis and reservoir quality in the Basal sandstone is also recommended.

To de-risk source quality it is recommended to do a regional study on the distribution and variation of the Farsund Formation source rock in the relevant area.

## 6 Conclusion

The Basal sandstone Prospect volume potential is reasonable in a success case. However, the prospect overall has relatively high risk with two dominating key risk that may not be mitigated within a reasonable time frame.

A drill decision could not be made timely by the 2<sup>nd</sup> March 2020 based on the current technical evaluation, it was therefore decided to drop the license.