Relinquishment Report of PL 731

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Faroe Petroleum Norge AS
Tullow Oil Norge AS

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Relinquishment Report of PL 731 in Block 8/10

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1 Key License History

PL 731 comprises an area of 56 km² at the Sørvestlandet High in Block 8/10, about 20km east of the Ula Field in the southern part of the Norwegian North Sea (Fig. 1.1). The partnership applied for the license as an extension to PL 666 in APA 2013, but since the majority of the main prospect (the Freya prospect) lies outside PL 666 it was awarded as an seperate license. Centrica Resources Norge AS (Centrica) has 40% working interest and operatorship in the license, whilst the partners Faroe Petroleum Norge AS and Tullow Oil Norge AS both have 30%. The work obligations were G&G work and a 1year drill or drop decision.

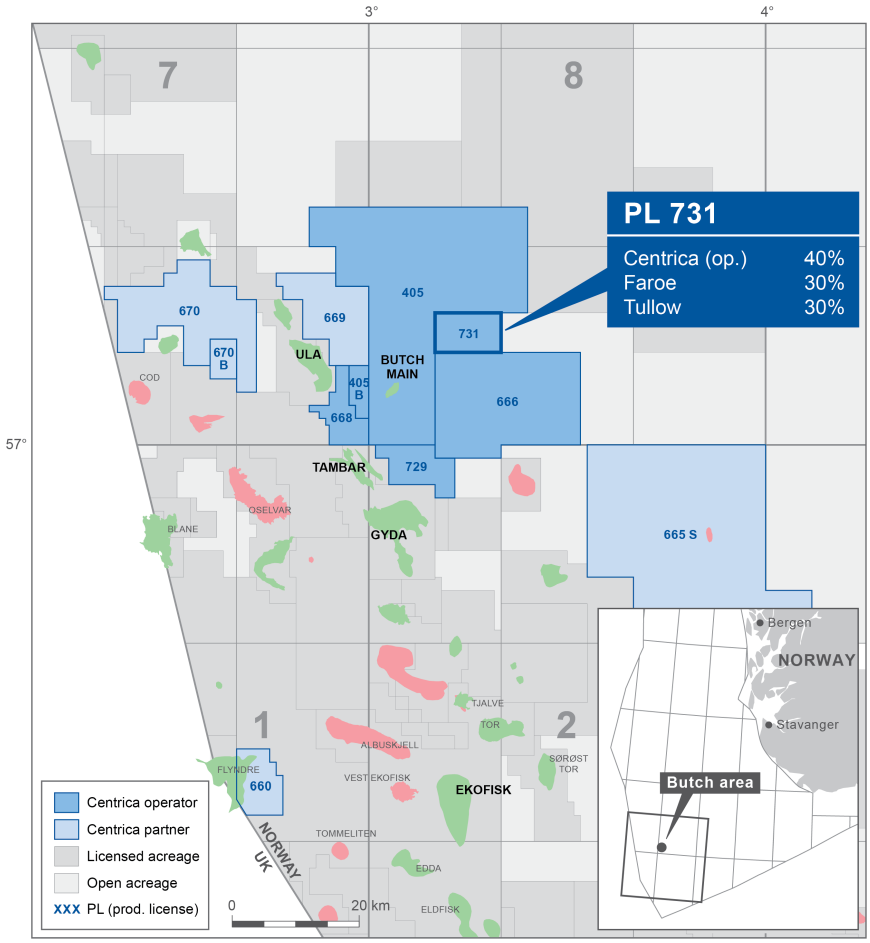


Fig. 1.1 PL 731 Location map. *PL 731 is located in Southern North Sea at the Sørvestlandet High on Block 8/10-1*

The work obligations are fullfilled and the G&G work will be described in this report. The licensees agreed on that the Freya prospect currently has too high risk and too small volumes to be a drillable prospct and herein unanimous voted to drop the license when the 1 year DoD decision was due. The license has conducted 2 combined EC and MC meetings in 2014. The Notice of Relinquishment letter was send to the Ministry of Petroleum and Energy February 2nd 2015 after the partnership had supported the Operators recommendation to drop the license on L2S January 22nd 2015.

2 Database

The common database for PL 731 comprises 5 3D seismic surveys and a numerous released and traded wells (Fig. 2.1). The CE1202 3D seismic survey, PSTM and PSDM, covers the whole license acreage and has been the major seismic survey used in the evaluation of the Freya prospect. The CE1202 is of good quality, although the imaging directly below the BCU is compromised by multiples and make the interpretation of the true dip of the Triassic strata, and the Upper Jurassic strata, difficult. The newly drilled 8/10-5S and 8/10-6S wells, are incorporated in the common database.

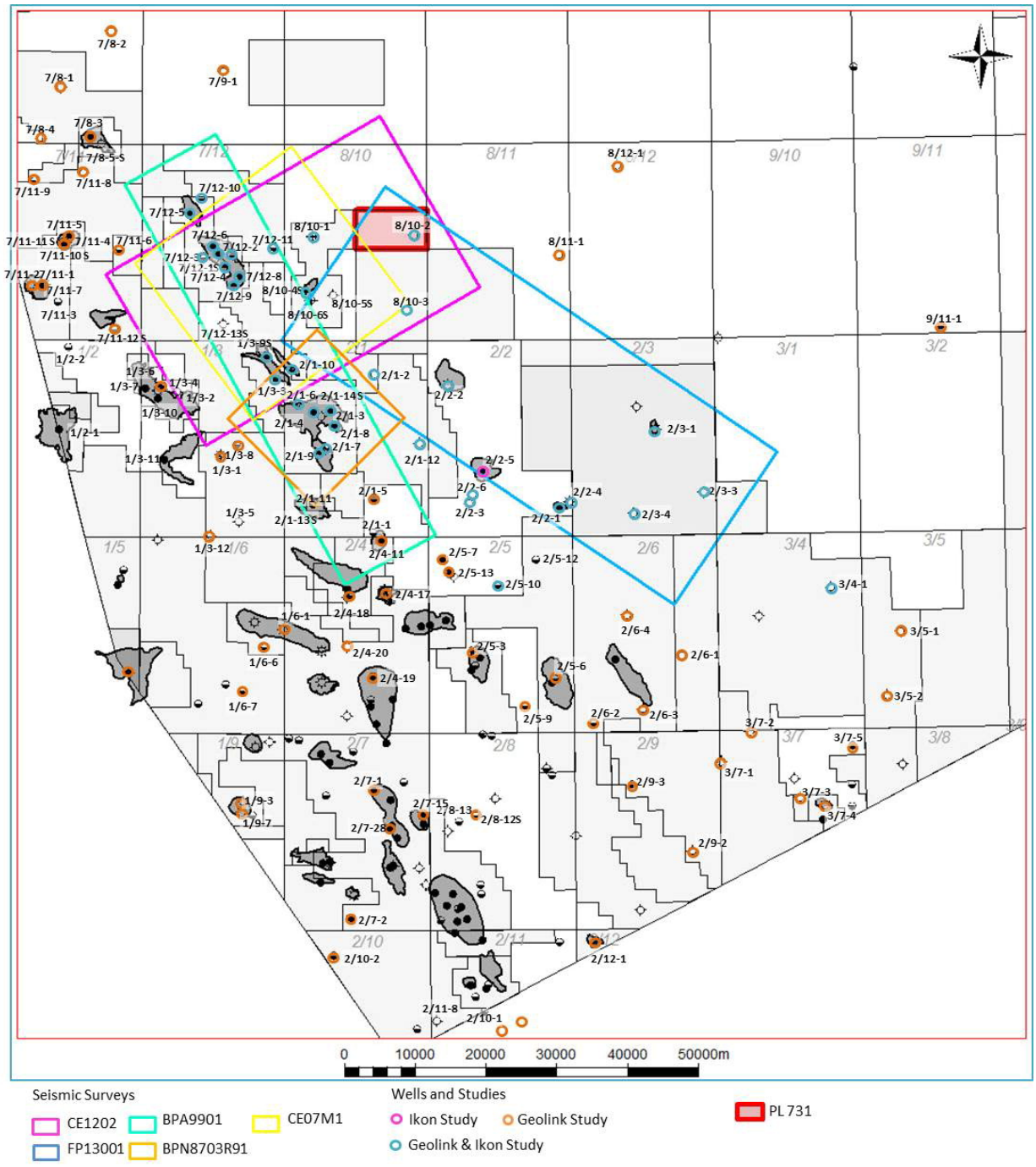


Fig. 2.1 PL 731 Common database. *The common database consist of 5 3D seismic surveys and the majority of the exploration wells in the area.*

3 Review of Geological Framework

As a part of the evaluation of the PL 405 Butch Discovery several studies in the Greater Butch Area have been conducted and some incorporated in the PL 731 common database. Since the APA 2013 application, results from these studies and the newly drilled exploration wells have influenced the attractiveness of potential resources in the PL 731 acreage.

Simultaneous inversion study

The PL405 license has undertaken an inversion study on the CE1202 PSDM raw gathers, carried out by Qeye labs, with a variety of output volumes including AI, SI, Vp/Vs and fluid/lithology prediction cubes. The resulting volumes are included in the database for PL731.

Hydrocarbon Prospecting based on IP measurement

ORG Geophysical AS carried out a DNME survey in the North Sea in August 2012 and strong IP anomalies were observed over the Ula Field and the Butch Discovery (8/10-4S). In August 2013 a new DNME line crossing the Freya Prospect was acquired, expecting to see the same anomaly if a hydrocarbon bearing reservoir is present. The line has been processed and used in Centrica`s internal evaluation of the Freya prospect, but has not been a part of the license common database since not all the partners have access to the line (Fig. 3.1).

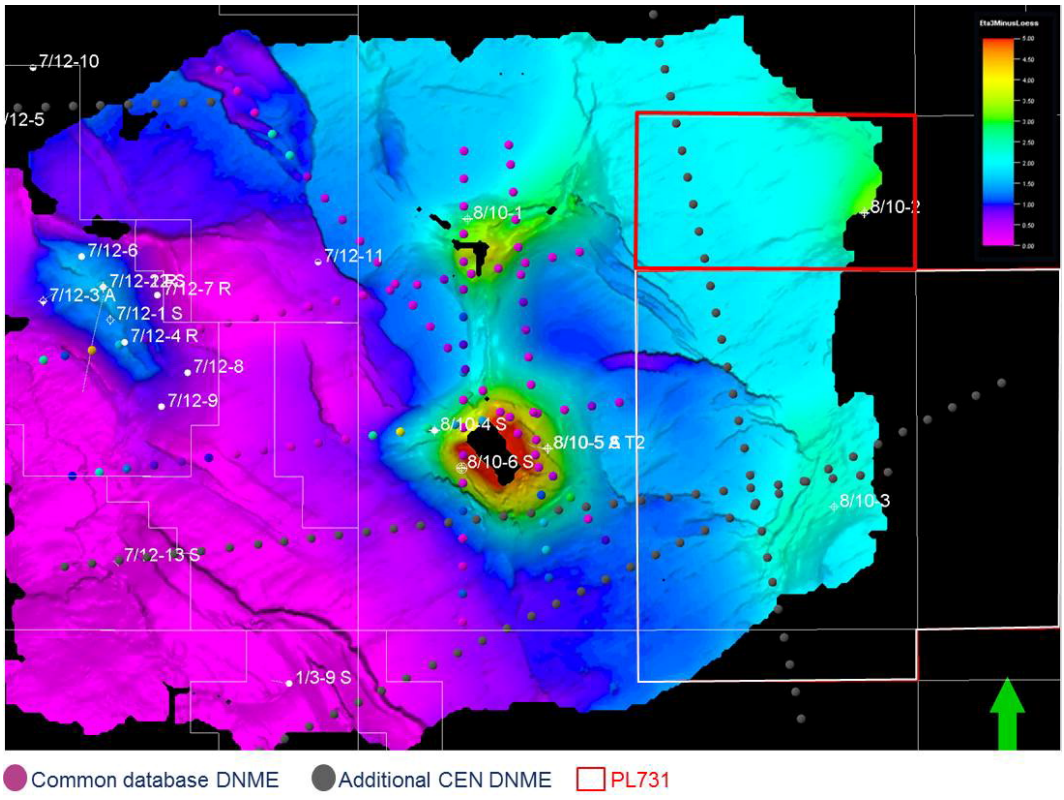


Fig. 3.1 Location of DNME lines. *The DNME line crossing the Freya Prospect is not a part of the PL 731 common database, hence no data is shown in the figure. Centrica, as the Operator, has used the DNME lines in the internal evaluation of the license.*

Petroleum System analysis of the Greater Butch Area

A semi regional hydrocarbon system study has been conducted by Torena AS in the Greater Butch Area (Torena, 2014).
The APA 2013 application trusted the (than) unproven Butch East source kitchen area to charge the Freya prospect. Torena, 2014 confirm that this basin should be in the present day oil window, with mature Mandal Fm and Farsund Fm source rock. However, the study also highlighted that the Freya prospects drainage area is mainly to the east of the prospect with little access to the mature basin. The conclusion is that some hydrocarbon expulsion has occurred in the drainage area, but source rock thicknesses close to 100 m or thicker are necessary to obtain satisfactory volumes (Fig. 3.2). This is regarded as unlikely. Eventual hydrocarbons will be low GOR oils.

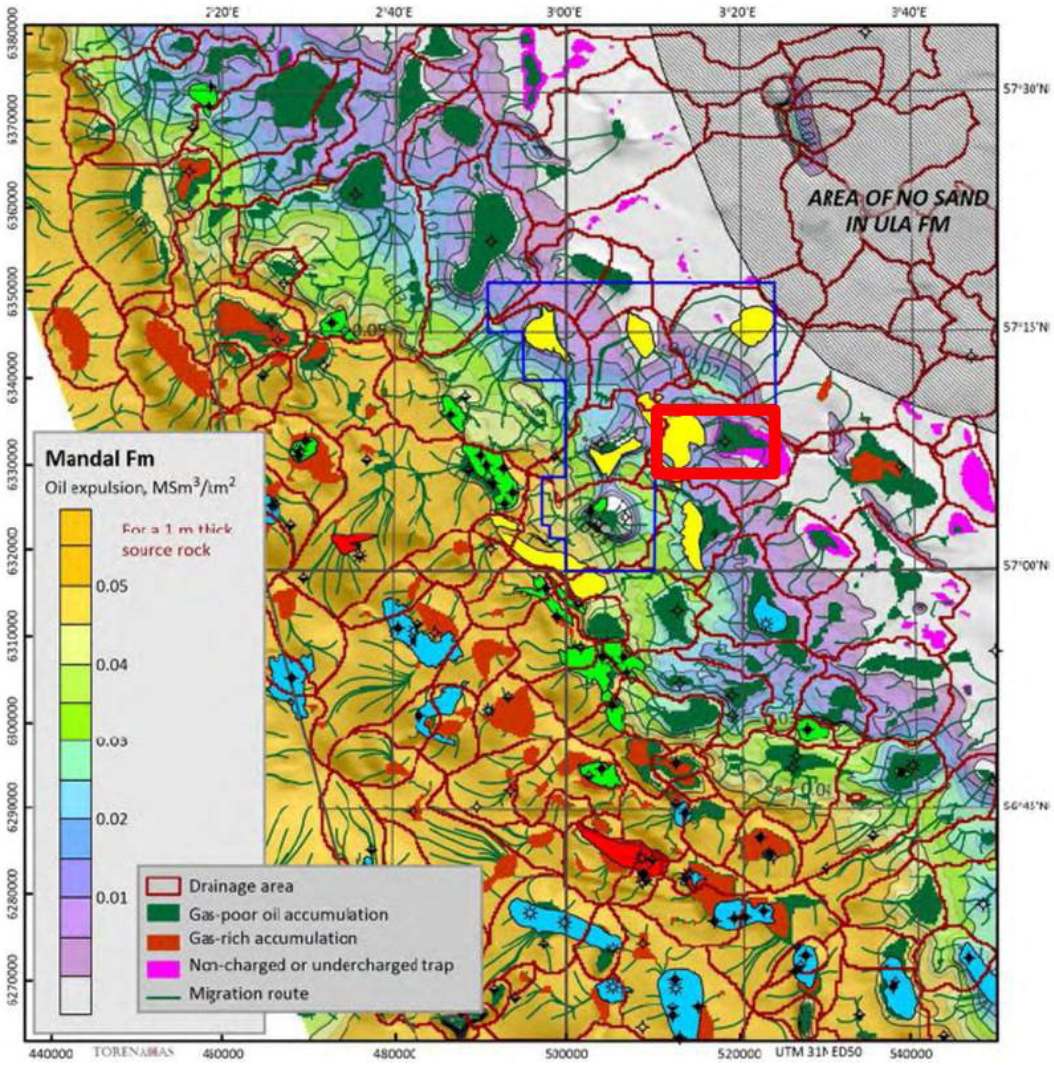


Fig. 3.2 Hydrocarbon system, drainage area and oil expulsion from Mandal Fm, Torena 2014. *Migration trends at present assuming there is a continuous carrier bed at Base Cretaceous Unconformity. The background map shows oil expulsion up to present for a 1m thick Mandal Fm all over. Also shown are non-charged traps, possibly charged traps, possibly charged migration routes and drainage areas for all traps. PL 731 location marked with red square.*

New exploration wells

A discovery in the Butch East 8/10-5 S well would have derisked the presence of a working hydrocarbon generating basin in the drainage area of the Freya prospect, but unfortunately this well proved dry with failure mechanism most likely lack of charge or retention (blown trap).
Karlsen Keros Consulting AS is in the process of carrying out a fluid inclusion study to gain a better understanding of the hydrocarbon system and migration routes in the area Greater Butch Area (Karlsen Keros, 2014). The study has identified one weak oil inclusion in a thin section from the Ula Fm in the 8/10-5S, supporting that the Butch East basin might be generation hydrocarbons. The observation is positive, but too speculative to justify a decrease in the expulsion risk.

Regional stratigraphic correlation and depositional environment study

The PL405 partnership engaged Geolink to do a detailed stratigraphic, biostratigraphical and seismic interpretation study of the Jurassic section across the Ula Trend in the greater area near the Butch Discovery (Geolink, 2012). This study has been updated with more wells and new seismic interpretations. The updated Geolink study (Geolink, 2014) is a part of the PL731 common database. The study indicates that it is likely that some Ula Fm, of upper flow regime tidal sand flat and tidal channels, is present in the eastern parts of Block 8/10 on Sørvestlandet High (Fig. 3.3).

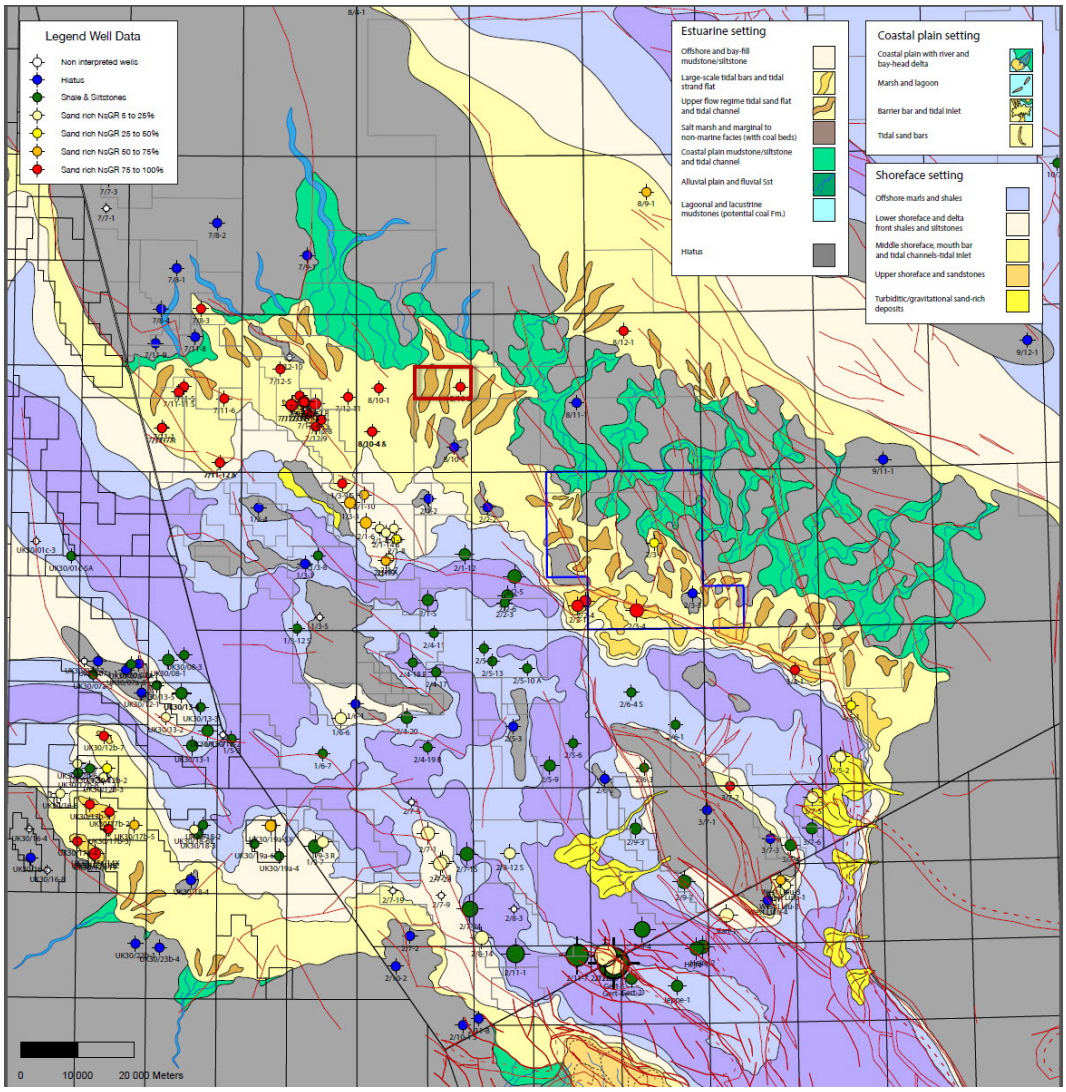


Fig. 3.3 Paleographic map Kimmeridgian time, Geolink 2014. *Geolink has generated several paleogeographic maps throughout the Jurassic series, with main focus on the Upper Jurassic Oxfordian to Tithoman time.*

The license members also have access to a study preformed by Ichron (Ichron, 2014) with similar conclusions as the Geolink, 2014 study, but this report is not described here in any detail since it is not a part of the common database.

Regional Pressure Study

As a part of PL 665 S G&G work, Ikon has updated a pressure study from 2007 with 12 additional wells (Fig. 2.1). The objective of the study was to evaluate regional pressure distribution, identify pressure barriers and assess possibility for hydrodynamic trapping mechanisms. The study is still ongoing and will be continued through PL665 S. The preliminary conclusion is that there is strong evidence for hydrodynamic flow and in general the Jurassic reservoirs are depleted presumably due to lateral drainage. This study is incorporated in the PL 731 common database.

4 Prospect Update

The Freya Prospect is located east of the 8/10-4S Butch Discovery on the Sørvestlandet High. The play model is the nju-3, Upper Jurassic with Ula Fm as reservoir rock and Mandal and Farsund Fms as sourcerock (Fig. 4.1), in a classic pod-intrapod setting created by movement of the underlying Zechstein salt.

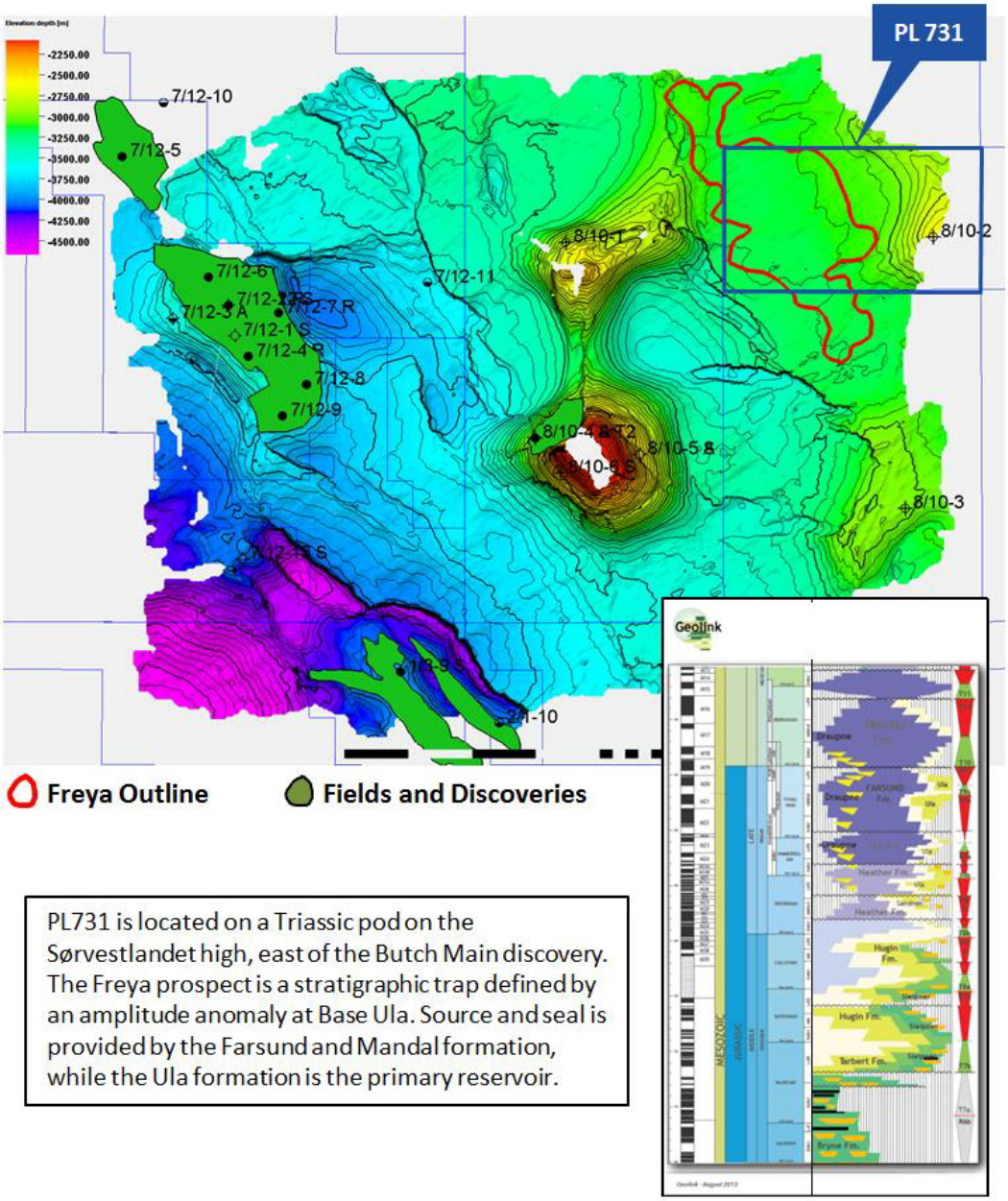


Fig. 4.1 Top Mandal Depth Map and Generalised Stratigraphic column

Trap and seal

The Freya prospect was in the APA 2013 application, and still is, defined as a stratigraphic trap with a bright amplitude response at the base Ula Fm level (Fig. 4.2 & Fig. 4.3). Expectations were that the amplitude anomaly was linked to the presence of hydrocarbons, corresponding to similar brightening of

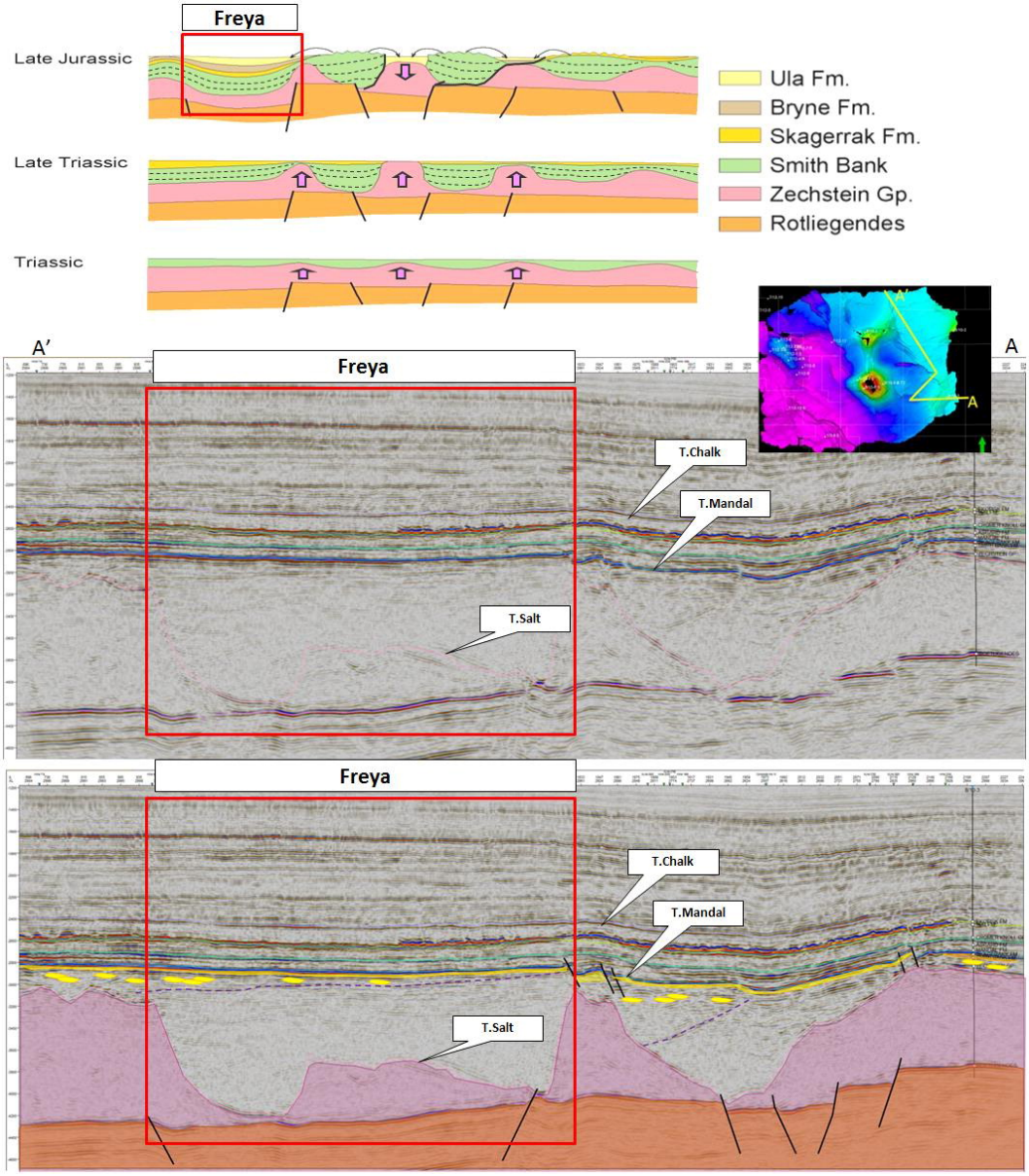


Fig. 4.2 Freya Regional Seismic line and assumed setting above a Triassic pod

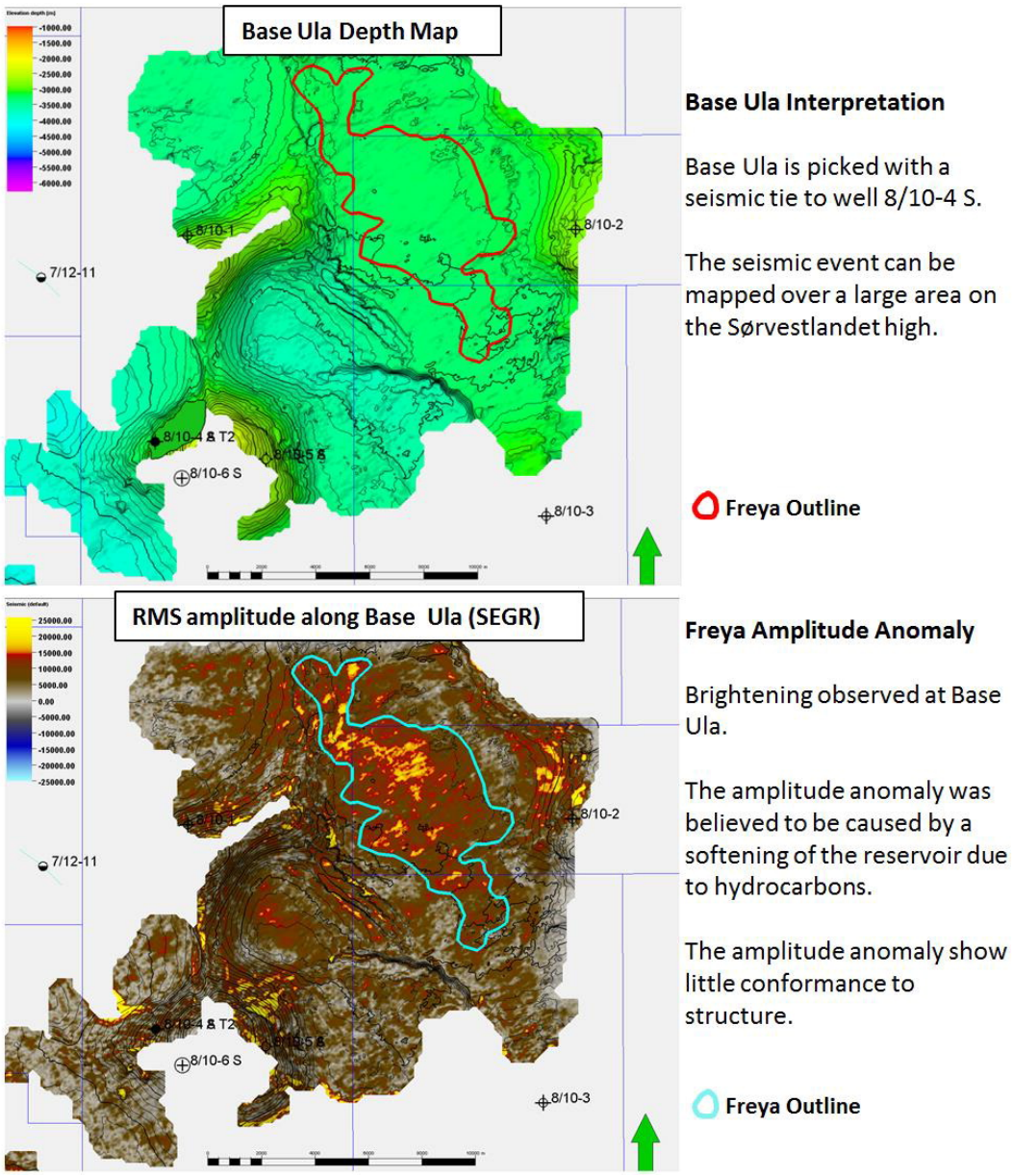


Fig. 4.3 Base Ula Fm Seismic Attributes

amplitudes at base Ula Fm level observed in the Butch oil discovery well 8/10-4 S. As no stratigraphic or structural trap component can be mapped (e.g. pinch outs, faults, closures), the understanding of the trap is purely based on the quantification of the amplitude anomaly observed.

Both a simultaneous AVO Inversion and Rock Physics Inversion have been undertaken in order to try and quantify the amplitude anomaly observed in the Freya Prospect (Fig. 4.4). Rock Physics modeling showed that there is a strong lithology contamination on the fluid response in the study area, and one could not expect strong DHIs. The inversion studies showed some indications of water saturated sands in Freya, but were in general inconclusive, and showed a poor match to the nearby 8/10-4 S well.

The interpretation work and amplitude analysis did not show any evidence that could support reducing the high trap risk.

Seal is provided by the regional extensive Mandal and Rødby Fms, and is considered to be very robust in areas less affected by late halokenisis.
Retention is not considered a key risk in the Freya Prospect.

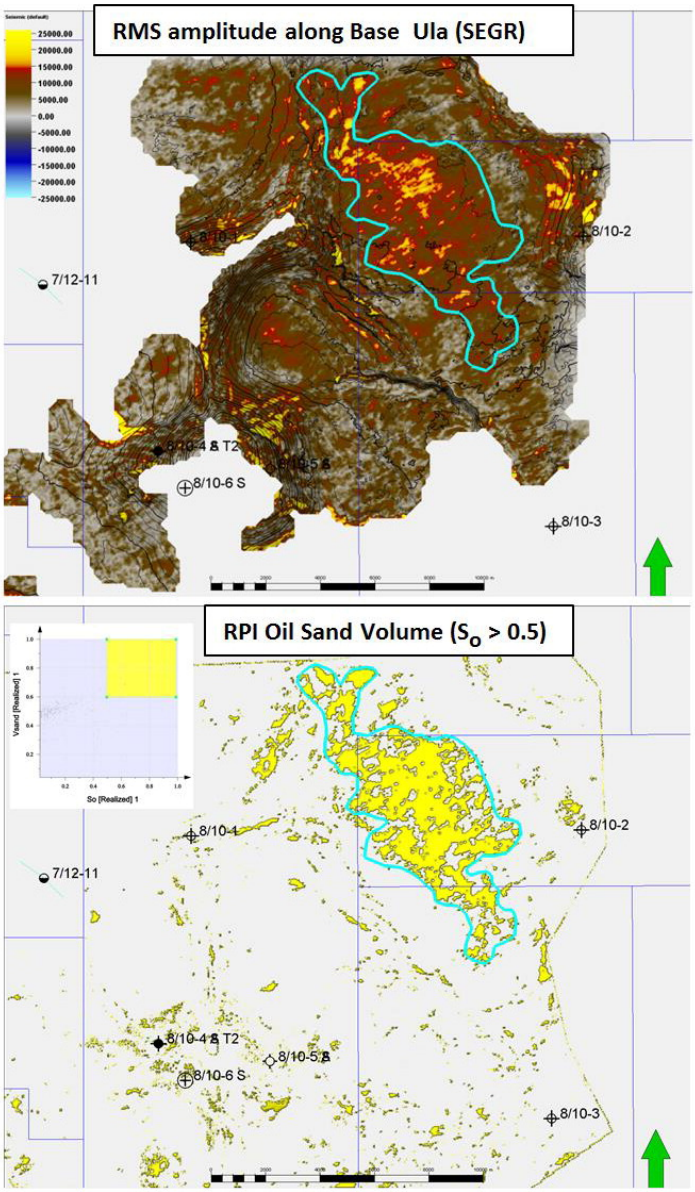


Fig. 4.4 Rock Physics Inversion Results

Reservoir

The license has access to regional depositional studies performed both by Geolink, 2014 and Ichron, 2014. The Geolink paleogeographical maps suggest some input of Ula Fm sandstones of Late Kimmeridigan and Early Volgian Age across the Freya Prospect. The sands are interpreted to be sourced from the Sørvestlandet High, further to the east-northeast. Ichron interpreted some tidal influence in the Butch East well (8/10-5 S), suggesting the sediment point source to be fairly close to the well position. This observation could place Freya in a setting with a more continental fingerprint, rather than a fully developed shoreface, increasing the reservoir presence-, thickness- and quality risk.
The prospect is located in the assumed eastern most extent of the Ula Fm reservoir sand fairway and the sandthickness is accordingly assumed to be fairly thin.

Freya is sitting on top of a Triassic pod with a structural tilt towards the W-SW. The pod has been tilted due to salt movement, such that the internal Triassic reflectors dip at 5-10° to the NW. A set of horizons onlapping the Triassic surfaces have been mapped and interpreted as the transgressive Ula system (Fig. 4.2)

Geophysical analyses have shown that seismic data is multiple contaminated and that the reservoir could be below tuning thickness, adding uncertainty to the interpretation of the reservoir presence. The relatively continuous seismic reflectors in the Freya Prospect suggest that there is little internal faulting that could cause compartmentalization of the reservoir.

The are some risks related to reservoir presence-, thickness- and quality- of the Ula Fm sands in the Freya prospect.

Source and Migration

Torena, 2014 increased the risk regarding hydrocarbon migration into the Freya prospect with only minor parts of the drainage area connected to the Butch East Basin. The migration route is also offset by several small scale faults with possible sealing capabilities Fig. 4.1. All in all the Freya Prospect appears to be unfavorably positioned for any oil or gas charge as it has a small and poor fetch area, and it is situated in the migration shadow for fill-spill from nearby structures (The Cassidy Prospect, PL405, to the west).

It is suggested that the main failure mechanism for the wells situated further east upon the Sørvestlandet High (8/10-1, 8/10-2 and 8/10-3) is charge of hydrocarbons. All the wells tested robust structural traps and did discover sand, but no shows have been reported.

Risking and uncertainty

In the APA 2013 application the trap was considered as the main risk due to uncertainty of existence of side seal and/or fault seal efficiency, with a total COS of 0.08. The main risk and the COS have remained the same throughout the license period, only with minor adjustments to the risk regarding each risk element. The main risk is the trap (40%, beeing stratigrapic with no structural component) followed by charge (40%, with long migration distance and limited hydrocarbon generation), reservoir (60%) and retention (80%).

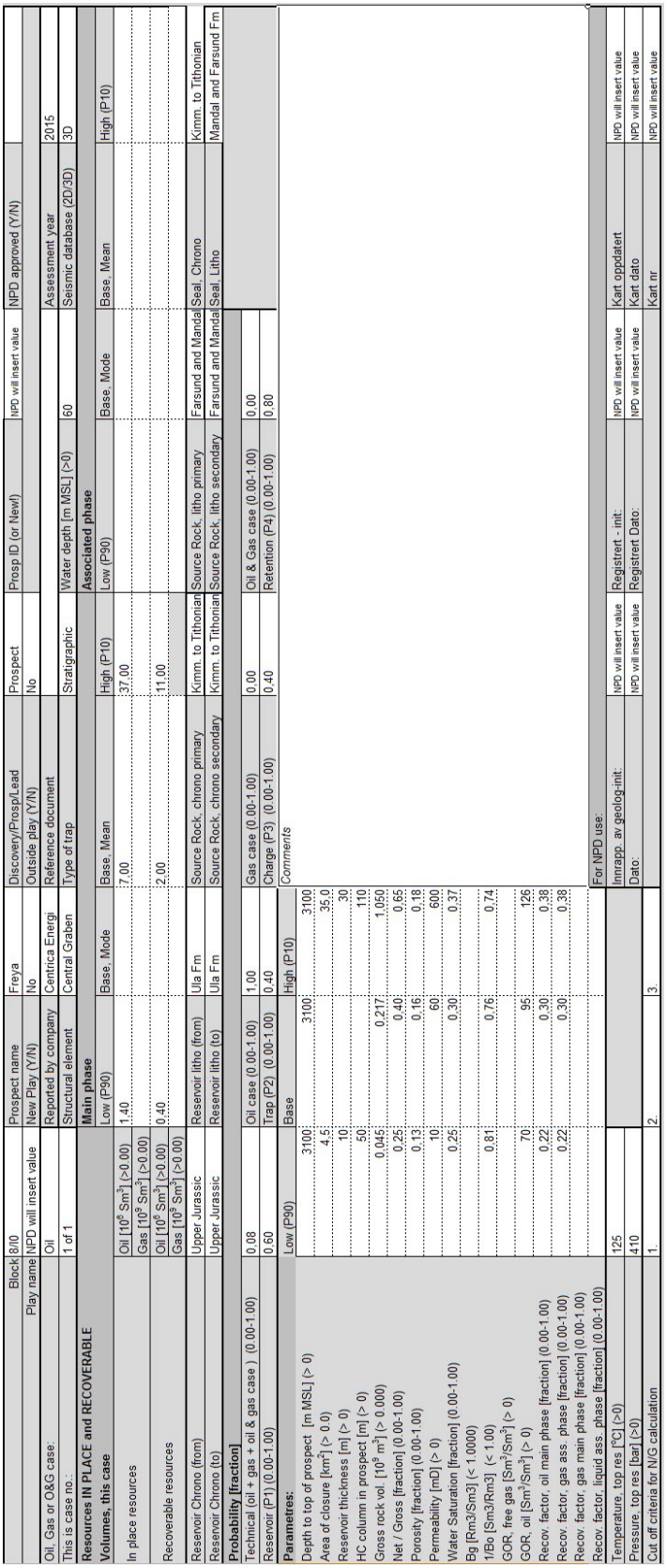
Volumetrics

The software REP is used to calculated the probabilistic volumes and the GRV input is the major relative uncertainty, with P10 GRV input based on the maximum amplitudes and reservoir thickness of 30m and P90 GRV input is based on the crestal part of the trap with a sandthickness of 10m. The rest of the input parameters are based on the wells in the Greater Butch area.

Freya Prospect	P90	P50	P10
Inplace mmboe	9	45	235
Recoverable resources mmboe	3	13	70

The prospect data are summarized in Table 4.1.

Table 4.1 Freya Prospect Data



	Block 8/10	Prospect name	Freya	Discovery/Prosp/Lead	Prospect	Prosp ID (or New!)	NPD will insert value	NPD approved (Y/N)	
	Play name NPD will insert value	New Play (Y/N)	No	Outside play (Y/N)	No				
Oil, Gas or O&G case:	Oil	Reported by company	Centrica Energi	Reference document				Assessment year	2015
This is case no.:	1 of 1	Structural element	Central Graben	Type of trap	Stratigraphic	Water depth [m MSL] (>0)	60	Seismic database (2D/3D)	3D
Resources IN PLACE and RECOVERABLE		**Main phase**				**Associated phase**			
Volumes, this case		Low (P90)	Base, Mode	Base, Mean	High (P10)	Low (P90)	Base, Mode	Base, Mean	High (P10)
In place resources	Oil [10^6 Sm^3] (>0.00)	1.40		7.00	37.00				
	Gas [10^9 Sm^3] (>0.00)								
Recoverable resources	Oil [10^6 Sm^3] (>0.00)	0.40		2.00	11.00				
	Gas [10^9 Sm^3] (>0.00)								
Reservoir Chrono (from)	Upper Jurassic	Reservoir litho (from)	Ula Fm	Source Rock, chrono primary	Kimm. to Tithonian	Source Rock, litho primary	Farsund and Mandal	Seal, Chrono	Kimm. to Tithonian
Reservoir Chrono (to)	Upper Jurassic	Reservoir litho (to)	Ula Fm	Source Rock, chrono secondary	Kimm. to Tithonian	Source Rock, litho secondary	Farsund and Mandal	Seal, Litho	Mandal and Farsund Fm
Probability [fraction]									
Technical (oil + gas + oil & gas case) (0.00-1.00)	0.08	Oil case (0.00-1.00)	1.00	Gas case (0.00-1.00)	0.00	Oil & Gas case (0.00-1.00)	0.00		
Reservoir (P1) (0.00-1.00)	0.60	Trap (P2) (0.00-1.00)	0.40	Charge (P3) (0.00-1.00)	0.40	Retention (P4) (0.00-1.00)	0.80		
Parametres:	Low (P90)	Base	High (P10)	*Comments*					
Depth to top of prospect [m MSL] (> 0)	3100	3100	3100						
Area of closure [km^2] (> 0.0)	4.5		35.0						
Reservoir thickness [m] (> 0)	10		30						
HC column in prospect [m] (> 0)	50		110						
Gross rock vol. [10^9 m^3] (> 0.000)	0.045	0.217	1.050						
Net / Gross [fraction] (0.00-1.00)	0.25	0.40	0.65						
Porosity [fraction] (0.00-1.00)	0.13	0.16	0.18						
Permeability [mD] (> 0)	10	60	600						
Water Saturation [fraction] (0.00-1.00)	0.25	0.30	0.37						
Bg [Rm3/Sm3] (< 1.0000)									
1/Bo [Sm3/Rm3] (< 1.00)	0.81	0.76	0.74						
GOR, free gas [Sm^3/Sm^3] (> 0)									
GOR, oil [Sm^3/Sm^3] (> 0)	70	95	126						
Recov. factor, oil main phase [fraction] (0.00-1.00)	0.22	0.30	0.38						
Recov. factor, gas ass. phase [fraction] (0.00-1.00)	0.22	0.30	0.38						
Recov. factor, gas main phase [fraction] (0.00-1.00)									
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)									
				For NPD use:					
Temperature, top res [°C] (≥0)	125			Innrapp. av geolog-init:	NPD will insert value	Registrert - init:	NPD will insert value	Kart oppdatert	NPD will insert value
Pressure, top res [bar] (>0)	410			Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
Cut off criteria for N/G calculation	1	2	3					Kart nr	NPD will insert value

5 Conclusions

PL 731 is located in the vicinity of the Centrica operated Butch Discovery (8/10-4S) and the acreage was acquired to secure resources in the area. As described above the evaluation of the Freya Prospect concludes that the license should be dropped due to an unattractive combination of low volume and high risk.
3D seismic less influenced by multiples, and hence better imaging of the sediment package below BCU, may reduce the risk related to trap and reservoir, but reprocessing/acquire new seismic is not regarded as feasible at this stage. The dry 8/10-5 S well failed to unambiguous prove a working hydrocarbon generating basin east of the Butch structure and increased the risk of any hydrocarbon charge even further east into the Freya prospect.
PL 731 unanimous agreed upon a negative drill decision and to relinquish the total acreage.

6 Reference

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