PL665 S Relinquishment Report

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1 Key Licence History

Licence Details

PL665 S is located in blocks 2/2, 2/3 and 3/1 in the southern part of the North Sea about 20 km east of the Gyda field, see Fig. 1.1. The licence was awarded to Faroe Petroleum Norge As, Valiant Petroleum Norge AS, Agora Oil & Gas AS and Centrica Resources (Norge) AS in 2013 as part of the APA 2012 round. In 2013 Capricorn Norge AS officially acquired Agora Oil & Gas AS and Ithaca Petroleum Norge AS officially acquired Valiant Petroleum Norge AS. In 2015 MOL Norge AS acquired Ithaca Petroleum Norge AS. This leaves the Licence holders at the termination of the Licence as follows:

Faroe Petroleum Norge AS (Operator) - 40%
Centrica Resources (Norge) AS - 20%
MOL Norge AS - 20%
Capricorn Norge AS - 20%

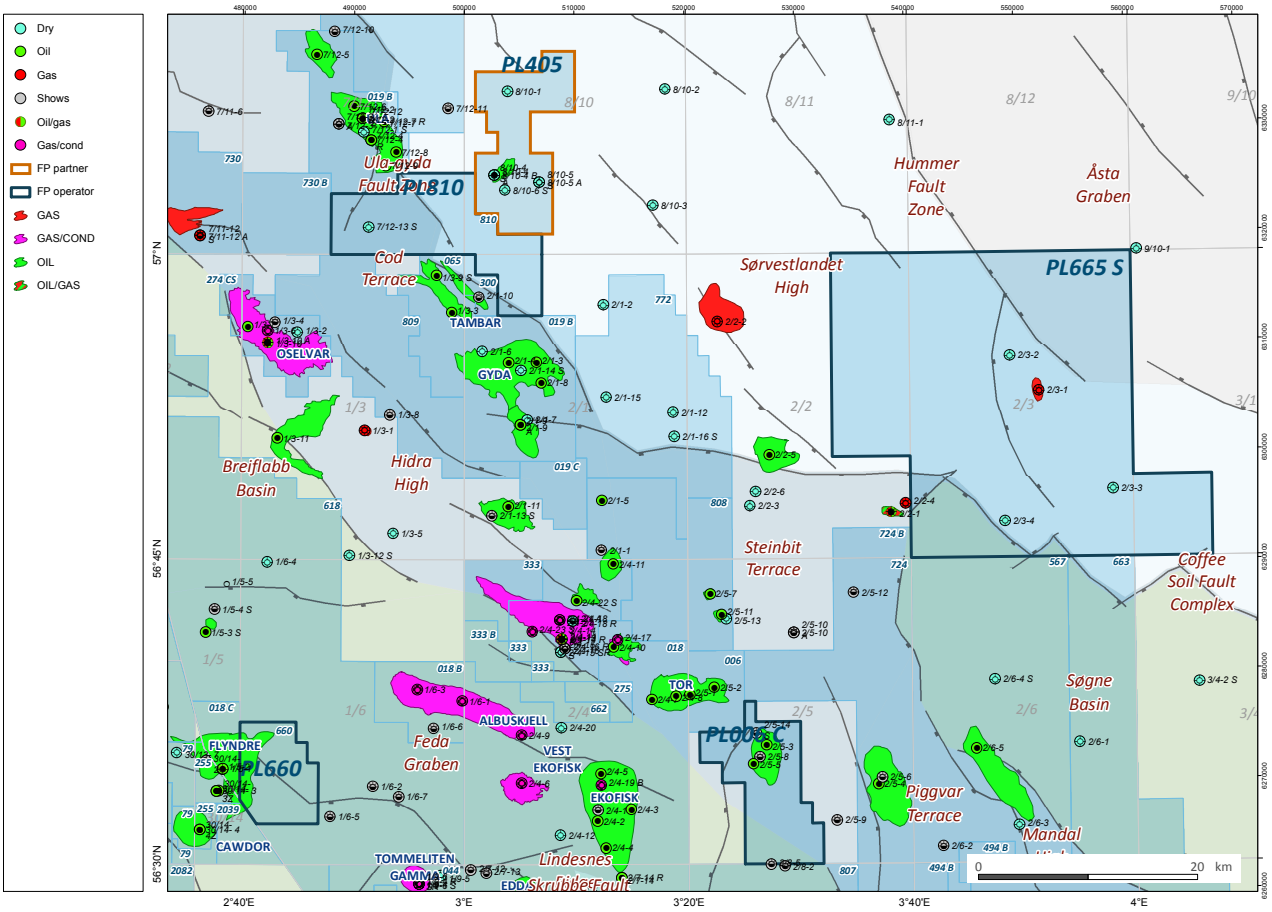

Fig. 1.1 PL665 S Overview

Licence Meetings

The following meetings were held in the Licence:

2013

- Exploration/Management Committee Meeting 1 14.03.2013
- Exploration Committee Meeting 09.04.2013
- Work Meeting 03.05.2013
- Exploration Committee PL665 S, PL666 and PL668 Petroleum Systems Workshop 15.05.2013
- Exploration/Management Committee Meeting 2 13.11.2013

2014

- Workshop 20-21.03 2014 together with PL666 and PL668
- Exploration/Management Committee Meeting 3 18.11.2014

2015

- Exploration Committee Meeting 4 06.10.2015
- Exploration/Management Committee Meeting 5 01.12.2015

Presentations and minutes from the meetings are on L2S.

Work Programme

The licence work programme included a 3D seismic acquisition and relevant geological and geophysical studies before a drill or drop decision was taken. This work programme was fulfilled with the acquisition of the FP13001 Pre Stack Depth Migrated (PSDM) seismic survey and several relevant studies described in Chapter 3 Review of the Geological Framework. FP13001 was acquired together with the licence partners in PL666.

The licence partners also merged and reprocessed parts of 3D seismic surveys: FP13001, SG9111, SG9703, BPN9111, SG9502, STT94, ANO9201T and SG9508 to the south-east of the licence. The new seismic interpretation was used as input into a regional petroleum system analysis.

The seismic processing of the FP13001 PSDM took longer than anticipated and therefore a 1 year licence extension to the drill or drop decision was applied for on 04.08.2014. Approval from the Ministry of Petroleum and Energy was granted on 03.10.2014.

Relinquishment

Following the completion of all technical work, the partnership have decided against drilling a well in the licence and hence a relinquishment letter was sent to the Ministry of Petroleum and Energy on the 22.01.2016.

2 Database

Seismic Database

The seismic database for PL665 S consisted of the surveys used in the application process, FP13001 and FP15M1. The FP13001 and FP15M1 surveys were added as part of the work programme, see Fig. 2.1. FP15M1 is a merge and reprocessing of parts of the FP13001, SG9111, SG9703, SG9502, SG9508, STT94, ANO9201T and BPN9111 surveys. The complete database is listed in Table 2.1.

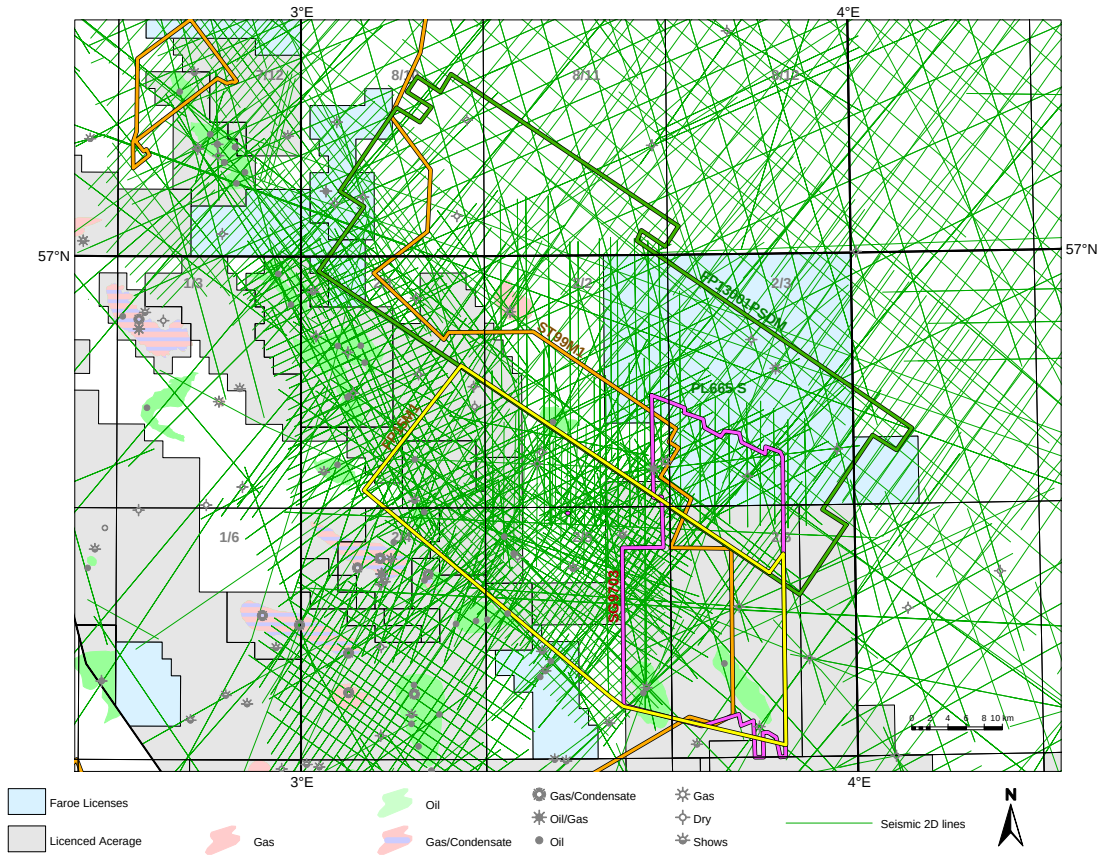

Fig. 2.1 Seismic Database for PL665 S

Outline of the 3D and 2D seismic surveys used in PL665 S. FP13001 is a new shoot PSDM survey and FP15M1 is a merge and reprocessing in the area south-east of the licence where the main source kitchen is located.

Table 2.1 Seismic database PL665 S

Survey	Type	Vintage	Version	Quality
FP13001	3D	2013	Full stack	Good
FP15M1	3D	mixed	Full stack	Good
SG9703	3D	1997	Full stack	Medium
ST99M1	3D	mixed	Full stack	Medium
AHN8702	2D	1987	Full stack	Poor/Medium
AHN9102	2D	1991	Full stack	Poor/Medium
ANO-8901	2D	1989	Full stack	Poor/Medium
BP80019	2D	1980	Full stack	Poor/Medium
BPN8704	2D	1987	Full stack	Poor/Medium
BPN8803	2D	1988	Full stack	Poor/Medium
BPN8901	2D	1989	Full stack	Poor/Medium
CAST-90	2D	1990	Full stack	Poor
CGME96	2D	1996	Full stack	Medium/Good
GNSR-91	2D	1991	Full stack	Poor
GUGM-94	2D	1994	Full stack	Medium/Good
MN9206	2D	1992	Full stack	Poor/Medium
MOB-81-2	2D	1981	Full stack	Poor/Medium
NS-76	2D	1976	Full stack	Poor
NS-78	2D	1978	Full stack	Poor
NSR04 - 31102	2D	2004	Full, Near,Mid and Far stack	Medium
NSR04 - 41113	2D	2004	Full, Near,Mid and Far stack	Medium
NSR04 - 42315	2D	2004	Full, Near,Mid and Far stack	Medium
NSR06 - 12312	2D	2006	Full, Near,Mid and Far stack	Medium
NSR06 - 42315	2D	2006	Full, Near,Mid and Far stack	Medium
NSR06 - 42321	2D	2006	Full, Near,Mid and Far stack	Medium
PC88	2D	1988	Full stack	Poor/Medium
PSL84	2D	1984	Full stack	Poor/Medium
SG8252	2D	1982	Full stack	Poor/Medium
SG8952	2D	1989	Full stack	Poor/Medium
SG9706	2D	1997	Full stack	Poor/Medium
SGT8606	2D	1982	Full stack	Poor/Medium
SH8201	2D	1982	Full stack	Poor/Medium
SHD97	2D	1997	Full stack	Poor/Medium
ST8716R91	2D	1991	Full stack	Medium
UG97	2D	1997	Full stack	Medium
UGI98	2D	1998	Full stack	Medium/Good
UGX98	2D	1998	Full stack	Medium/Good

Well Database

The Well database consisted of all released wells in the area and the 8/10-4 S & A wells. Several studies have been performed on selected wells from the database. The different studies and their pertinent wells are illustrated in Fig. 2.2 and Fig. 2.3.

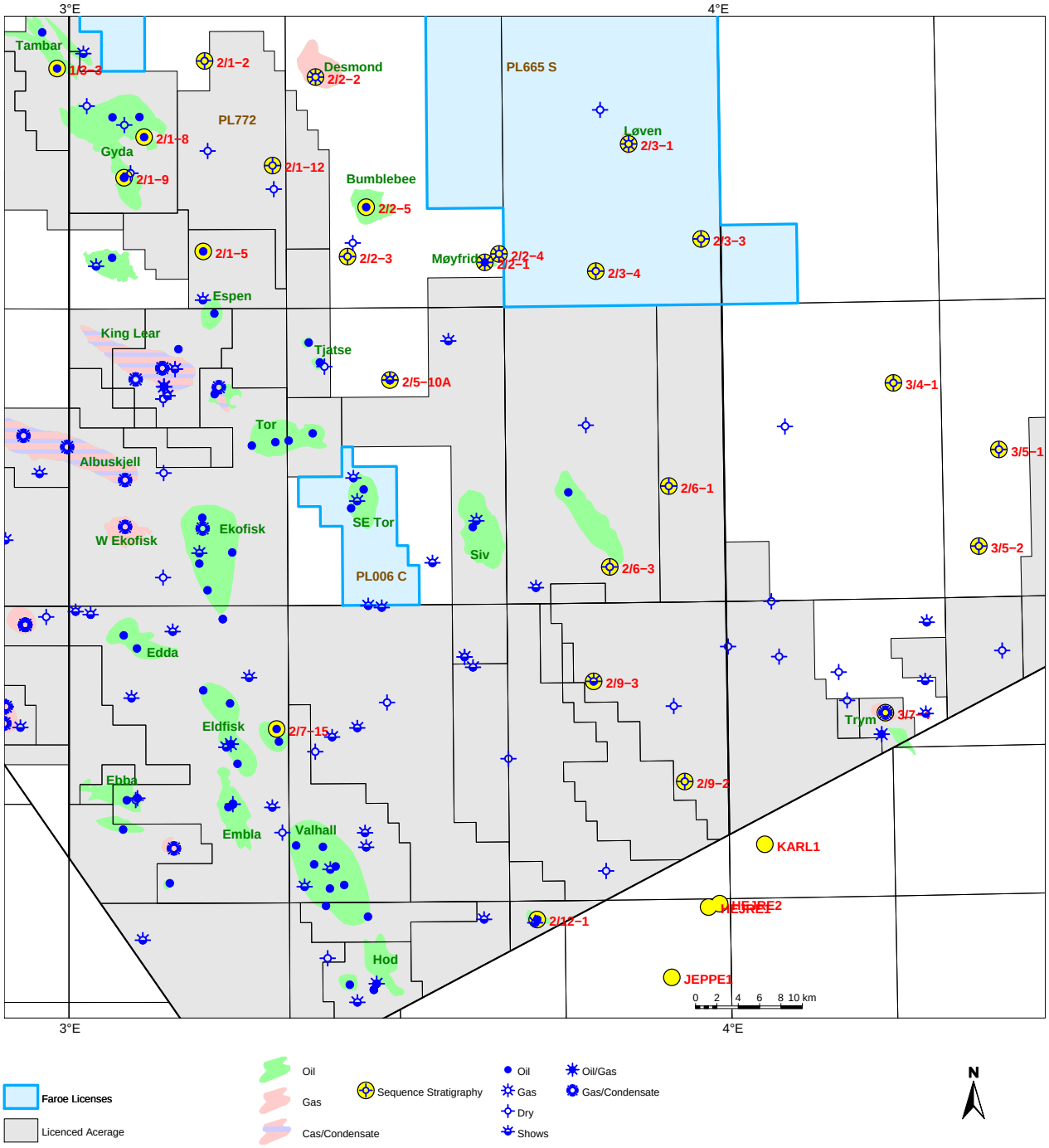

Fig. 2.2 Well Database used for Sequence Stratigrapy Study for PL665 S
The wells selected for the Sequence Stratigraphy Study are circled in yellow.

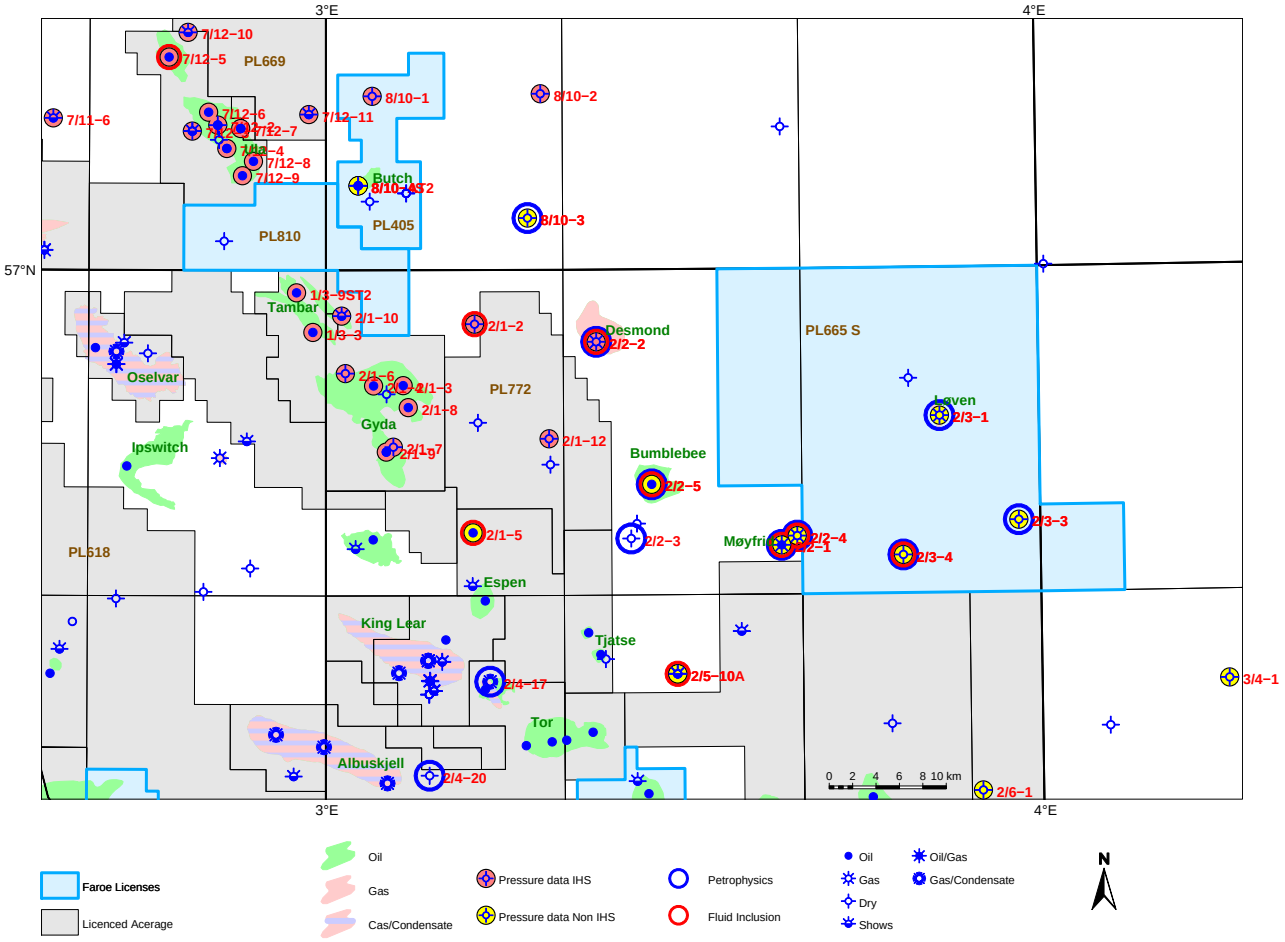

Fig. 2.3 Well Database and wells selected for different studies in PL665 S

The wells selected for the Petrophysical Analysis, Fluid Inclusion Study and Pressure Study are marked in different colours described in the figure legend.

3 Review of the Geological Framework

Geological Setting

PL665 S is located at the intersection between the Sørvestlandet High, the Steinbit Terrace and the Søgne Basin. The licence is situated on the flank of the prolific petroleum province of the Central Graben. To the north and the east of the licence, several dry wells have been drilled while to the south and the west a number of discoveries and producing fields can be found.

Prospects and leads with reservoirs at Jurassic and Lower Permian levels have been worked up in the licence. The Lower Permian prospect and leads depend upon being sourced from a potential Carboniferous basin, whereas the Jurassic prospects rely on the more conventional Upper Jurassic Mandal and Farsund formations source rocks.

Fluid Inclusion

A fluid inclusion study was done by Karlsen Keros Consulting AS on behalf of the partnership. The conclusions of this study indicate that most of the analysed wells have contained oil very similar to the Ula Field with a gas/oil ratio (GOR) of 70 m^3/m^3. The results for well 2/3-4 indicate that there is migration of oil in the area and that either a live or a palaeo oil water contact (OWC) exists in the vicinity. On the negative side, the results indicate that the 2/2-4 well shows no evidence of hydrocarbon migration. These results give a positive impact to the Cara Prospect but are negative for the filling of the Mello Prospect.

Pressure

A semi-regional pressure study was performed by Ikon GeoPressure on behalf of the PL665 S, PL666 and PL668 licences. The study aimed to identify pressure barriers and define hydrodynamic trends in the Jurassic. The trend for the Ula and Bryne formations indicate flow towards the east, while data from the Farsund and Mandal formations, indicates flow towards the west.

Sequence Stratigraphy

Geolink performed a sequence stratigraphic study on behalf of the PL665 S licence. The work included the interpretation and correlation of 27 wells. This has resulted in the definition of new well tops, correlation cross-sections, Fig. 3.1, stratigraphic charts and maps showing the depositional environments in the area. Improved understanding of the depositional environments has helped in the evaluation of the prospects and resulted in a higher reservoir risk for one of the main prospects, see Fig. 3.2.

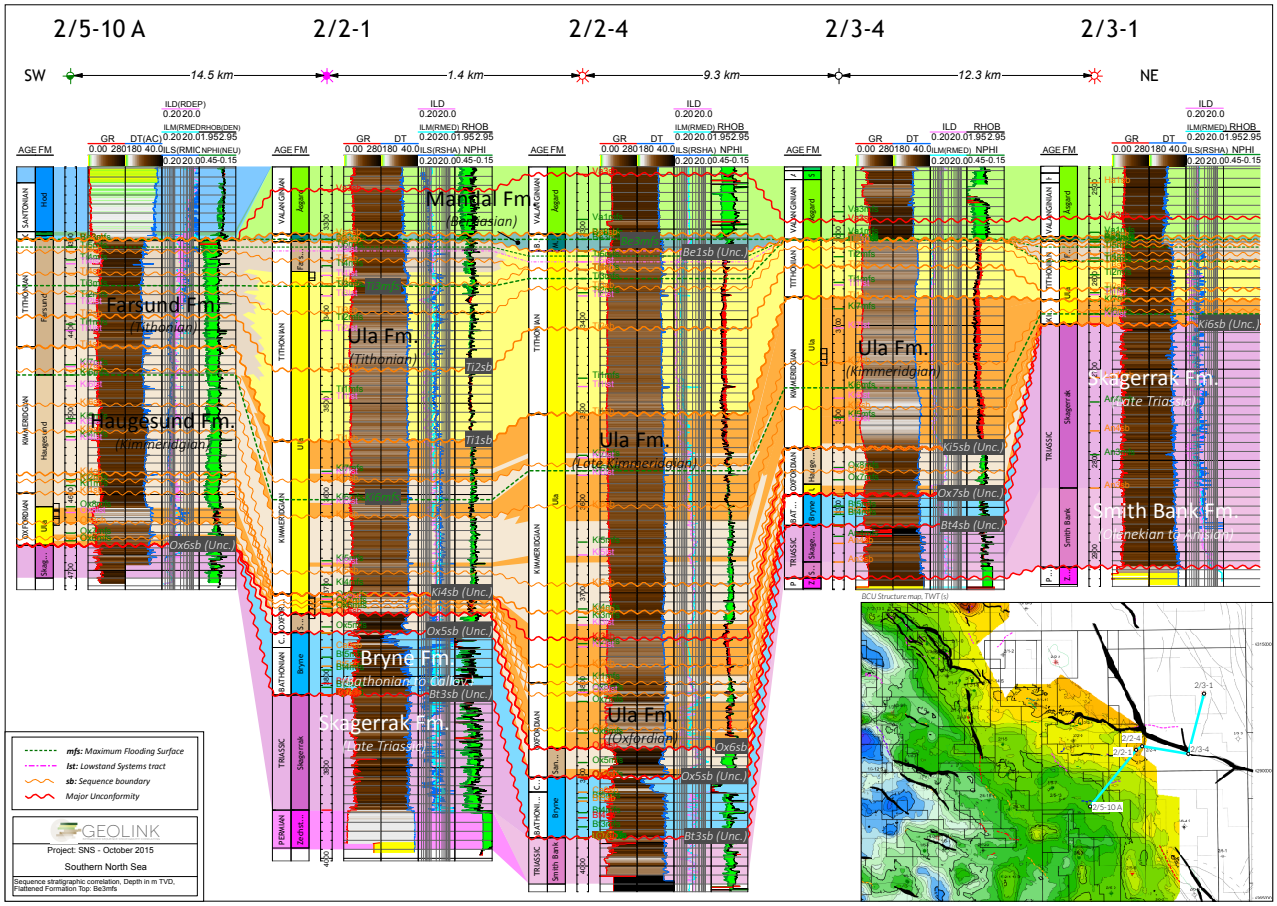

Fig. 3.1 Well-correlation from Steinbit Terrace across Sørvestlandet High
Geolink

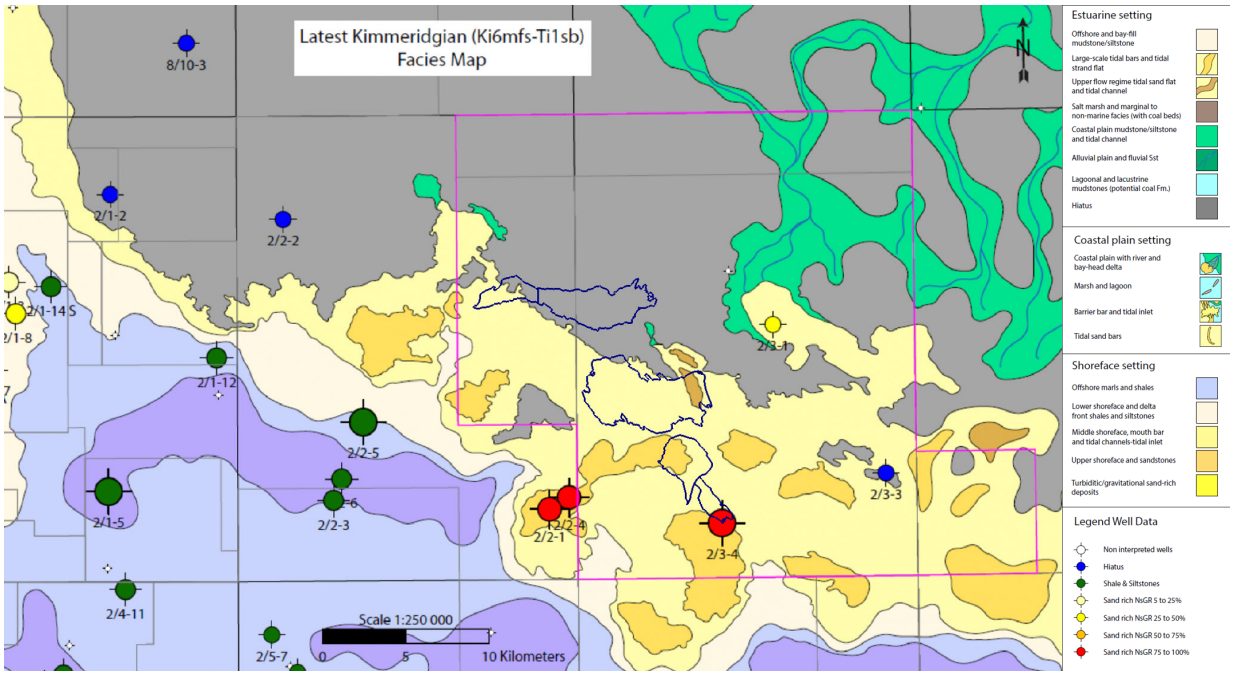

Fig. 3.2 Facies Map Latest Kimmeridgian
Ki6mfs-Ti1sb
Example from Geolink Study

Petrophysical Analysis

Faroe performed in-house petrophysical analyses of 11 relevant wells containing the Ula, Sandnes, Bryne, Skagerrak, Smith Bank and Rotliegend formations.The results where used in the volumetric calculations for the prospects.

Petroleum System Analysis

Torena AS performed an extensive basin modelling study covering the FP15M1 survey outline. Migration is the main risk in the licence and the new seismic data improved the quality of the input maps used in the modelling significantly, leading to very good temperature calibration with the wells. Unfortunately, the new migration maps did not reduce the risk on migration for our prospects, see Fig. 3.3. It did however highlight the foot-wall ridge immediately to the north of well 2/2-1 and 2/2-5 as a promising area for hydrocarbon charge, if there are any traps and reservoir possibilities in this area. The majority of this area is located outside the licence. Migration at the top Triassic level also looks more optimistic for the prospects in the licence, see Fig. 3.4.

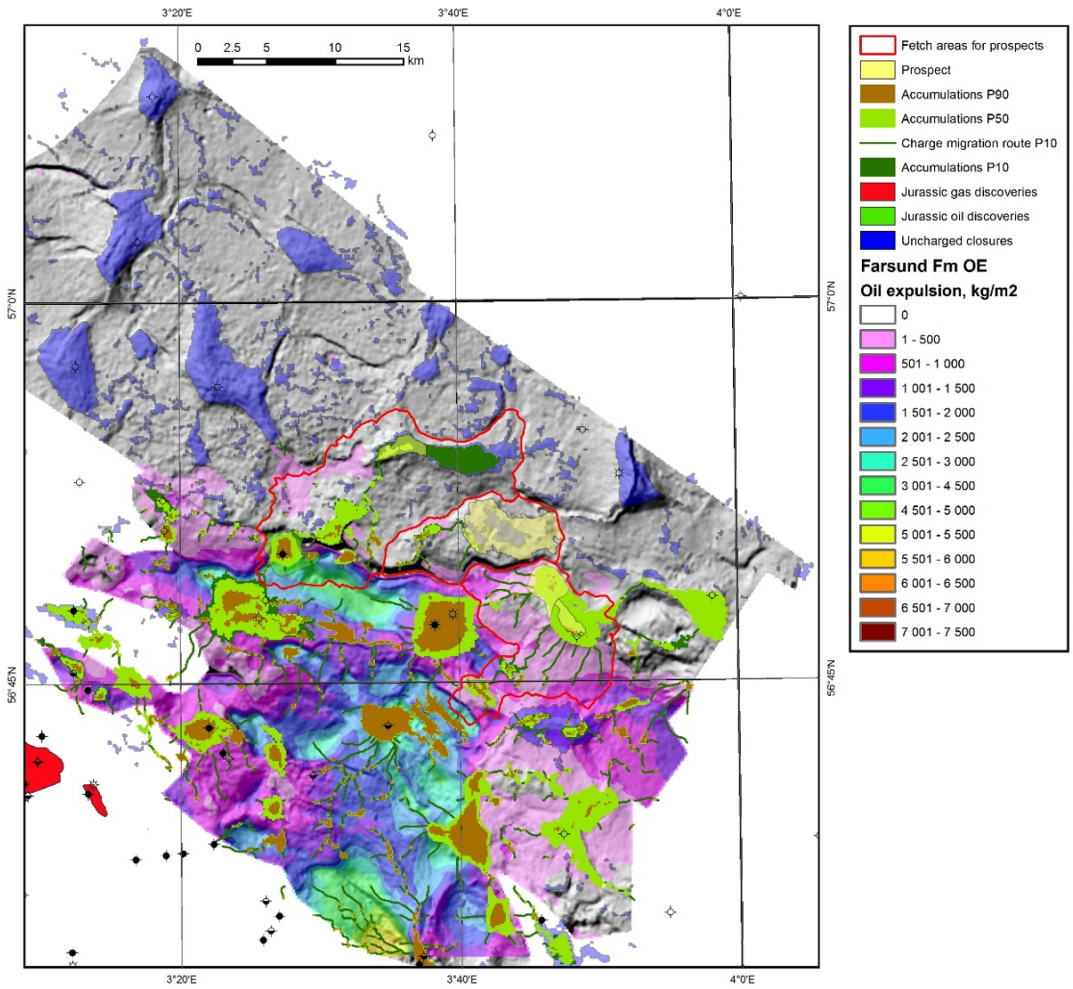

Fig. 3.3 Hydrocarbon migration at BCU level.
Brown polygons are oil-filled traps assuming rather conservative migration efficiency 5 % ~P90 case.
Light green polygons are oil-filled traps assuming moderate migration efficiency 20% ~P50 case.
Dark green polygons are oil-filled traps assuming high migration efficiency 44 % ~P10 case.

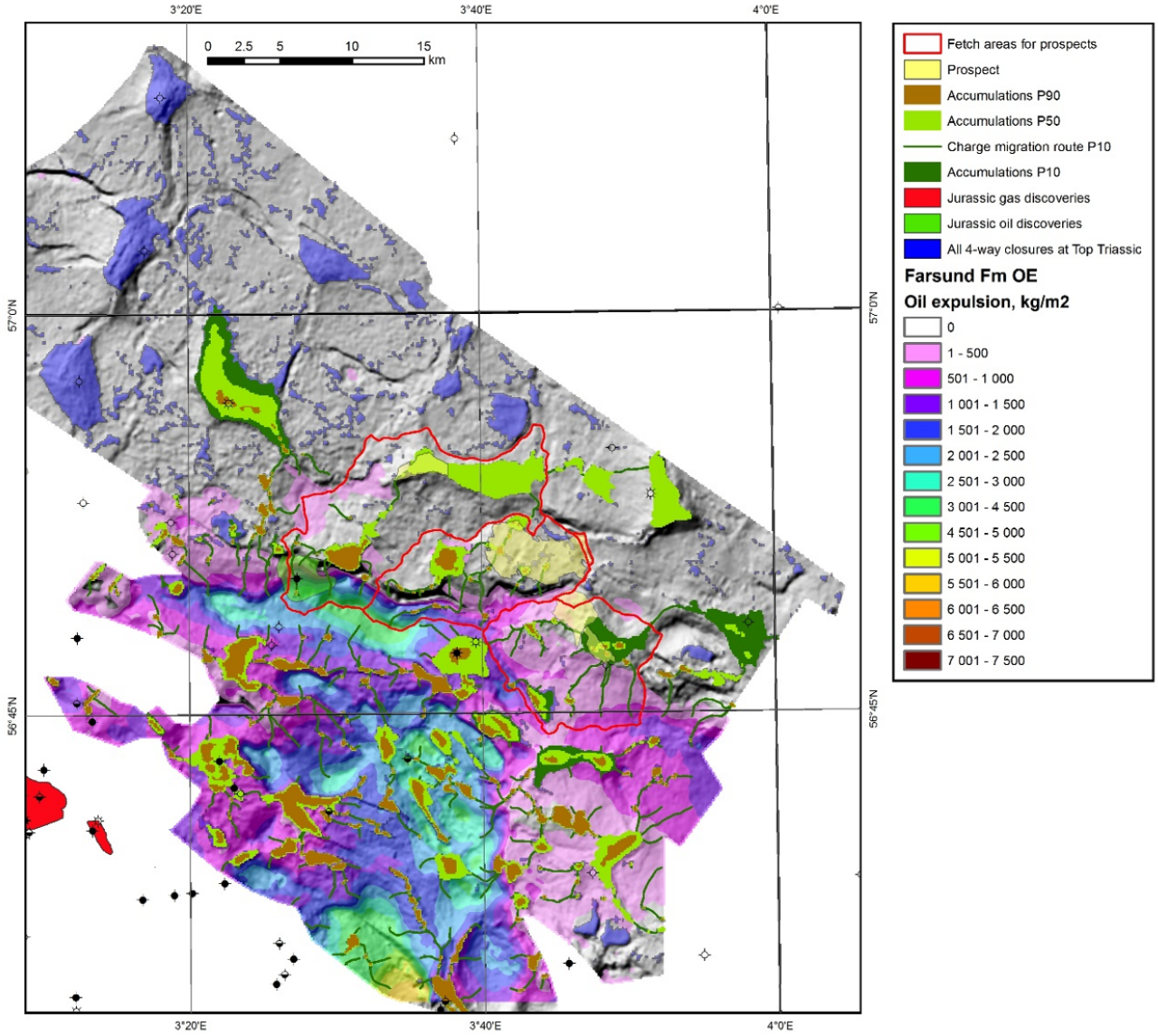

Fig. 3.4 Hydrocarbon migration at Top Triassic level.
Brown polygons are oil-filled traps assuming rather conservative migration efficiency 5 % ~P90 case.
Light green polygons are oil-filled traps assuming moderate migration efficiency 20% ~P50 case.
Dark green polygons are oil-filled traps assuming high migration efficiency 44 % ~P10 case.

4 Prospect Update

Four main prospects where identified in the Licence:

- The Upper Jurassic Picnic, Minstrel and Caramello prospects, see Fig. 4.1. Caramello is split into two parts, Cara and Mello, in the prospect evaluation.
- The Rotliegendes Bamsemums Prospect, see Fig. 4.2.

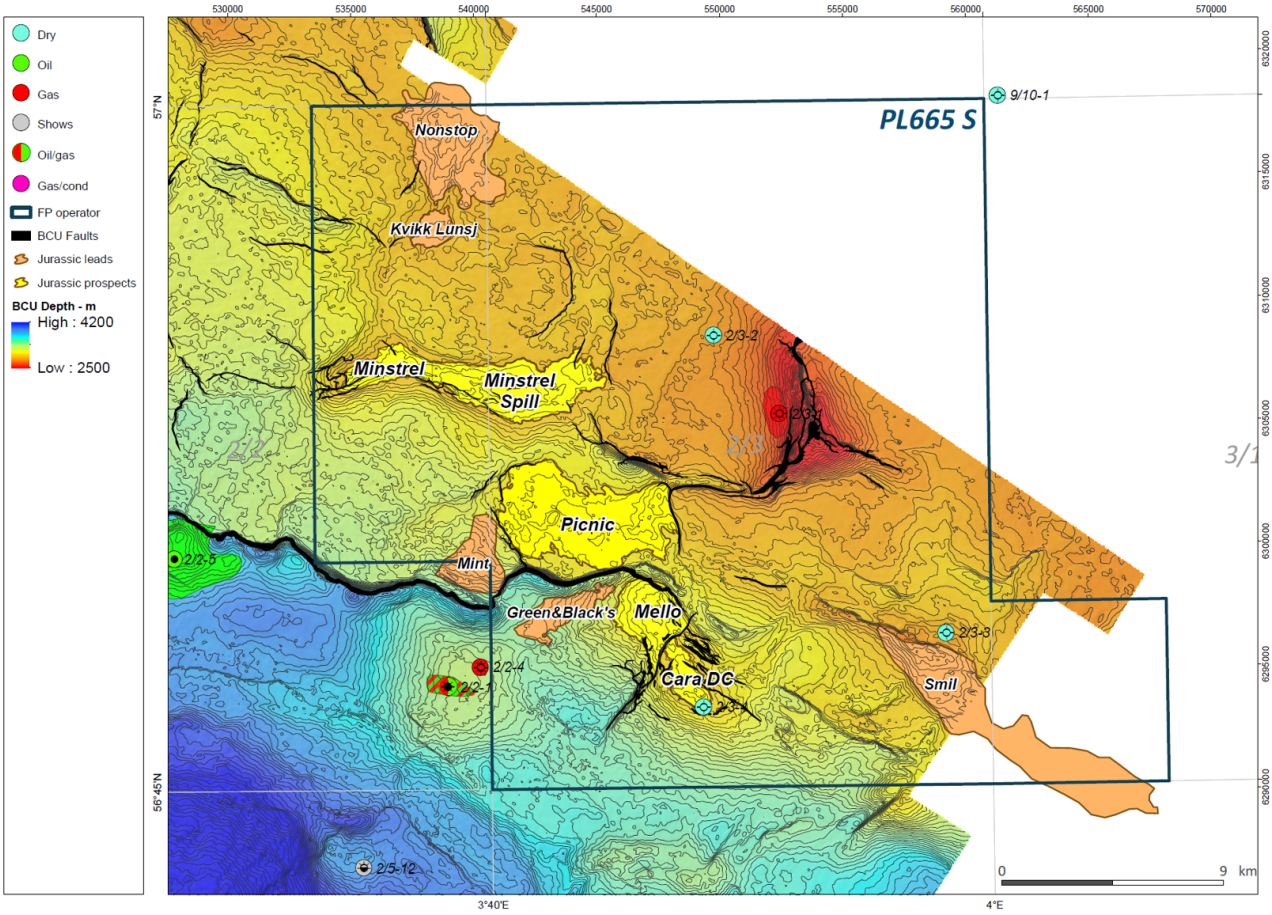

Fig. 4.1 Jurassic prospects and leads
Map showing the main Jurassic Ula Formation prospects and leads on BCU level.

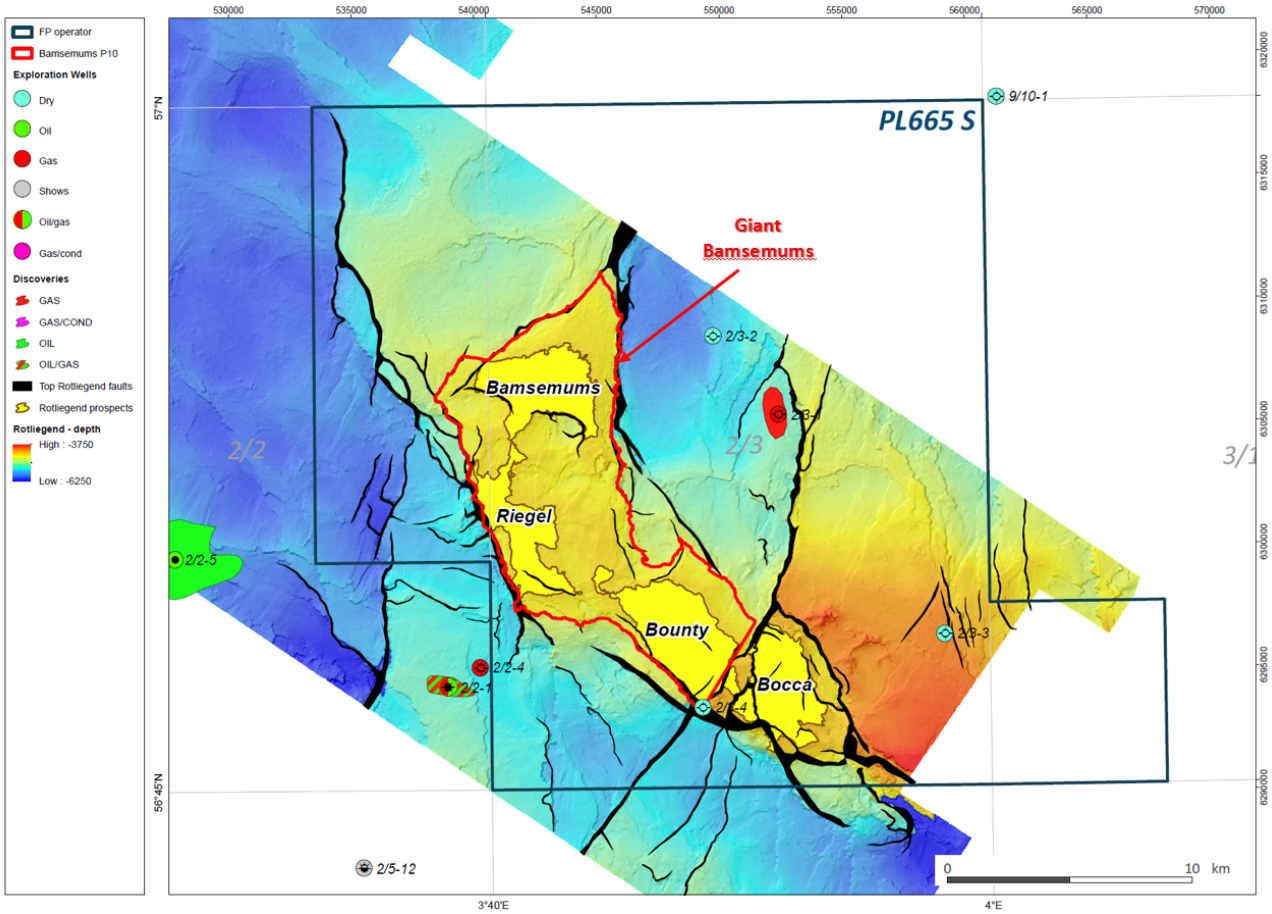

Fig. 4.2 Permian prospects and leads
Map showing the Permian prospects and leads.

Caramello Prospect

The Caramello structure is an elongate, north-northwest to south-southeast trending faulted anticline. The eastern part of the structure was drilled with the 2/3-4 well by Gulf in 1984, see Fig. 4.3. Since the licence application was submitted, the prospect has been split in two, the Cara and the Mello prospects which are separated by a fault. The Mello Prospect has a size of 22.7 mmboe and a risk of 20% with the main risks being fault seal and source. The Cara Prospect is the small four way dip closure updip of well 2/3-4. It has a volume potential of 10.5 mmboe and a risk of 28%, where the main risk is considered to be migration.

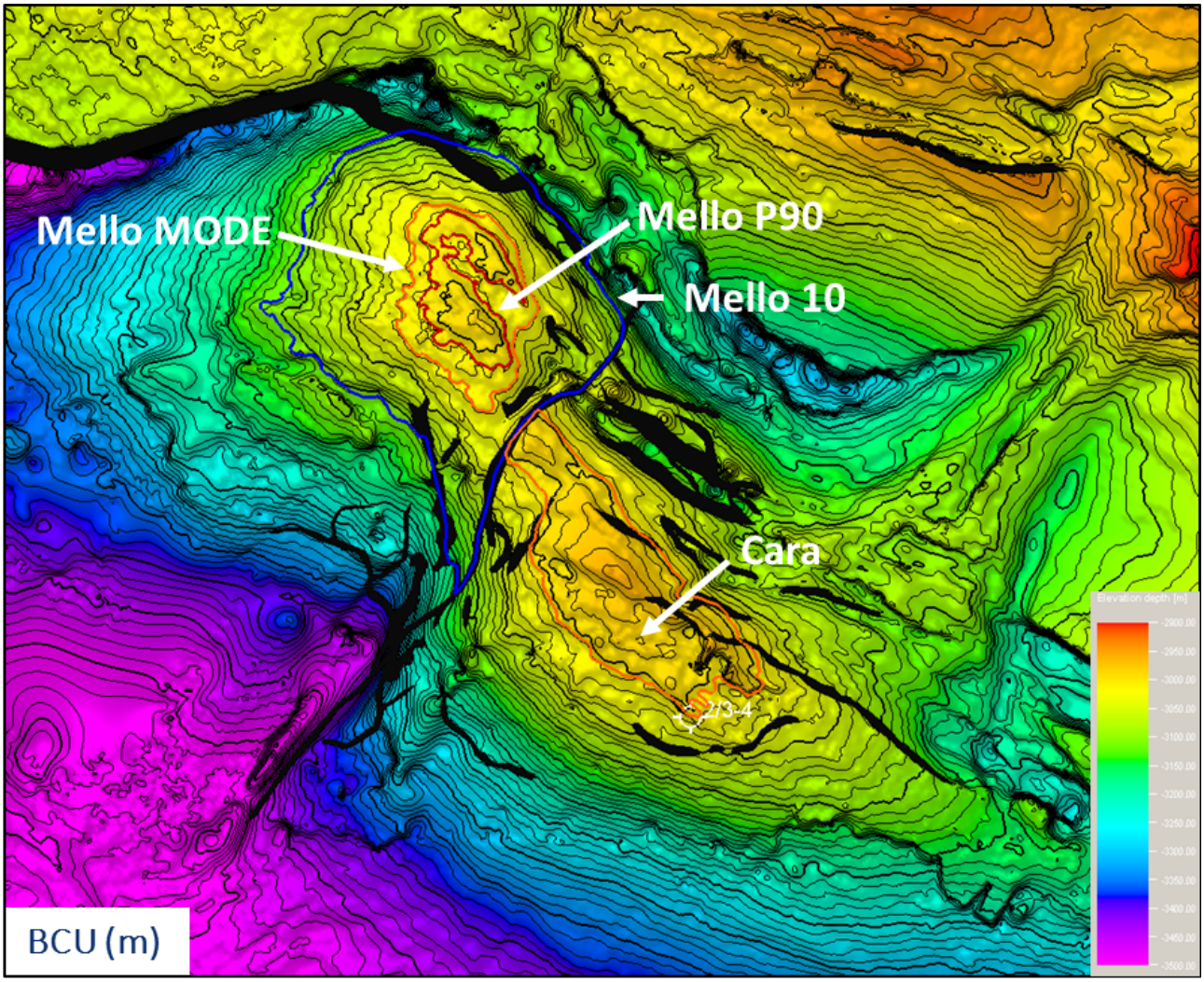

Fig. 4.3 Caramello, Cara and Mello prospects
BCU map showing the closures for Cara and Mello. Note that high cases for Mello are dependant on fault seal towards Cara. Cara volumes are limited by the dry well.

- **Trap**
  The trap for the two prospects Cara and Mello is well defined as a four-way closure. Cara is updip of the dry 2/3-4 well, while Mello has an independent closure with an upside depending on fault seal towards Cara. The Ula Formation is thick and sand-rich in the area and a sand-against-sand fault is therefore unlikely to seal.
- **Reservoir**
  Reservoir is expected to be the Upper Jurassic Ula sandstones. Well 2/3-4 encountered 191 meters of high quality Ula sands, resulting in the reservoir risk being very low. Other wells in the area have all encountered thick Ula Formation sands with excellent reservoir properties.
- **Charge**
  Petroleum system modelling indicates limited hydrocarbon generation in the area. For the Mello Prospect the presence of an under-filled structure on the migration route complicates the filling of the structure and increases the risk on charge and migration. Pressures taken in the 2/3-4 well indicate that the entire Ula section is in the same pressure

regime.
The Fluid Inclusion Study found that cuttings from well 2/3-4 have hydrocarbon indications in the very top of the Ula Formation. A small up-dip potential in the Cara Prospect is therefore possible.

- **Seal**
  For the Mello Prospect the bounding fault towards the dry 2/3-4 well is the main seal risk. The fault juxtaposition is not sufficient to offset the thick sands found in the area. Salt could have propagated up the fault and caused it to seal, but there are no indications of this on the seismic data. Well 2/2-1 just south-west of Mello, has oil in the Oxfordian part of the Ula Formation and water above in the younger Ula sands. There are shaly lithologies separating the water and oil filled sands. A poorer net to gross in the Mello Prospect compared to the closest 2/3-4 well could increase the likelihood of fault seal, however there are no indications from seismic data that the sand quality deteriorates from the 2/3-4 well to the Mello Prospect.
  The Cara Prospect is only dependant on the top seal provided by Lower Cretaceous shales and marls from the Cromer Knoll Group.

Minstrel Prospect

The Minstrel Prospect is an east-west orientated anticline, formed by a Zechstein salt swell above a major Permian horst block, see Fig. 4.4. The prospect is of limited size with volumes calculated to 10,7 mmboe. Risk is quite high at 16%, with the main risks being reservoir presence and migration.

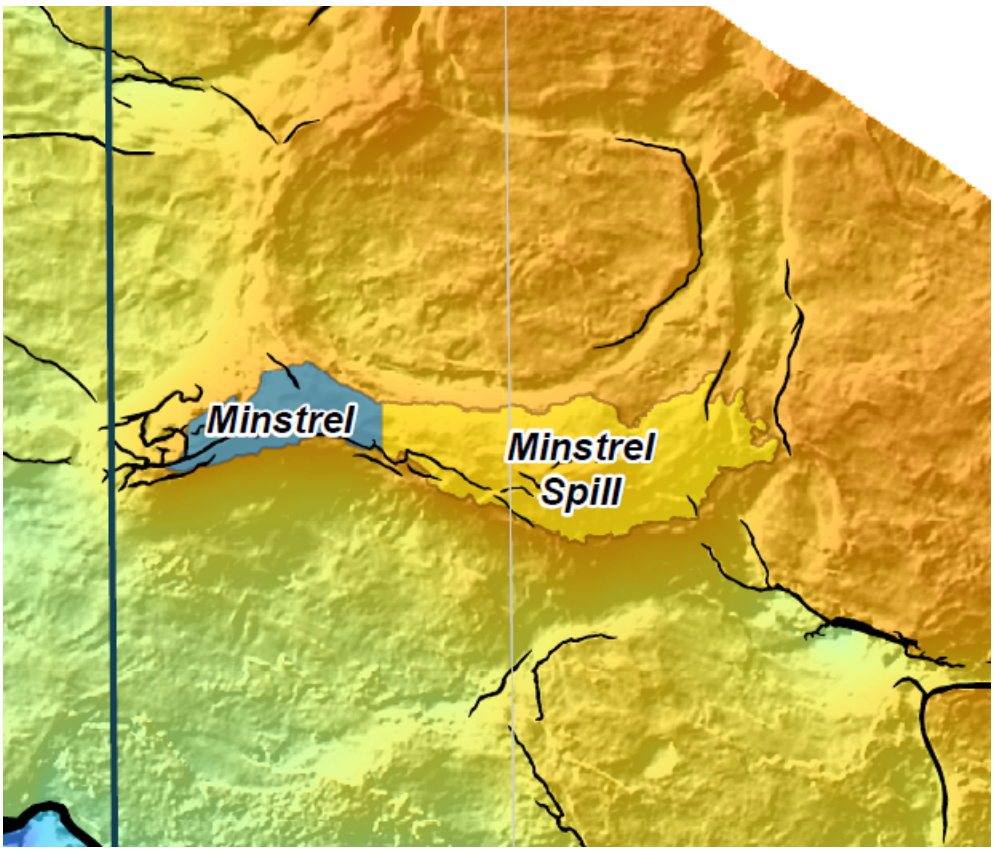

Fig. 4.4 Minstrel Prospect

- **Trap**
  The trap is defined as an anticline formed over a Permian horst block. The Jurassic sections thins over the prospect, indicating that it was relatively high during the deposition of the Ula Formation sandstones. The anticline has two culminations, with the most pronounced four-way dip closure being to the east.
- **Reservoir**
  The reservoir is expected to be a thin wedge of Upper Jurassic Ula Formation sandstone located immediately above Middle Jurassic Bryne Formation coal, see Fig. 4.5 . The western part of the structure has bright amplitudes on the seismic. This seismic character has been penetrated in nearby wells and represent the Bryne Formation coal. The bright amplitudes are only present on the western tip of the prospect and this could limit the reservoir distribution across the structure. The non-coaly part of the structure looks similar to the Triassic in nearby areas. The Jurassic interval is thinner on the platform than in the basin. This is indicated both by well and seismic data. Degradation in both distribution and quality of the reservoir reduces the volume of the Minstrel Prospect significantly.
- **Charge**
  Charge is considered high risk for the Minstrel Prospect as it lies significantly further away from the source kitchen and is separated from the basin by a major fault. The Ula Formation sandstones, which can act as a carrier beds for hydrocarbon migration, appear to be pinching out across the platform before reaching the Minstrel structure on the seismic data.
- **Seal**
  Top seal is provided by the same Lower Cretaceous shales and marls as for Caramello. The prospect being shallower than Cara makes top seal a low risk.

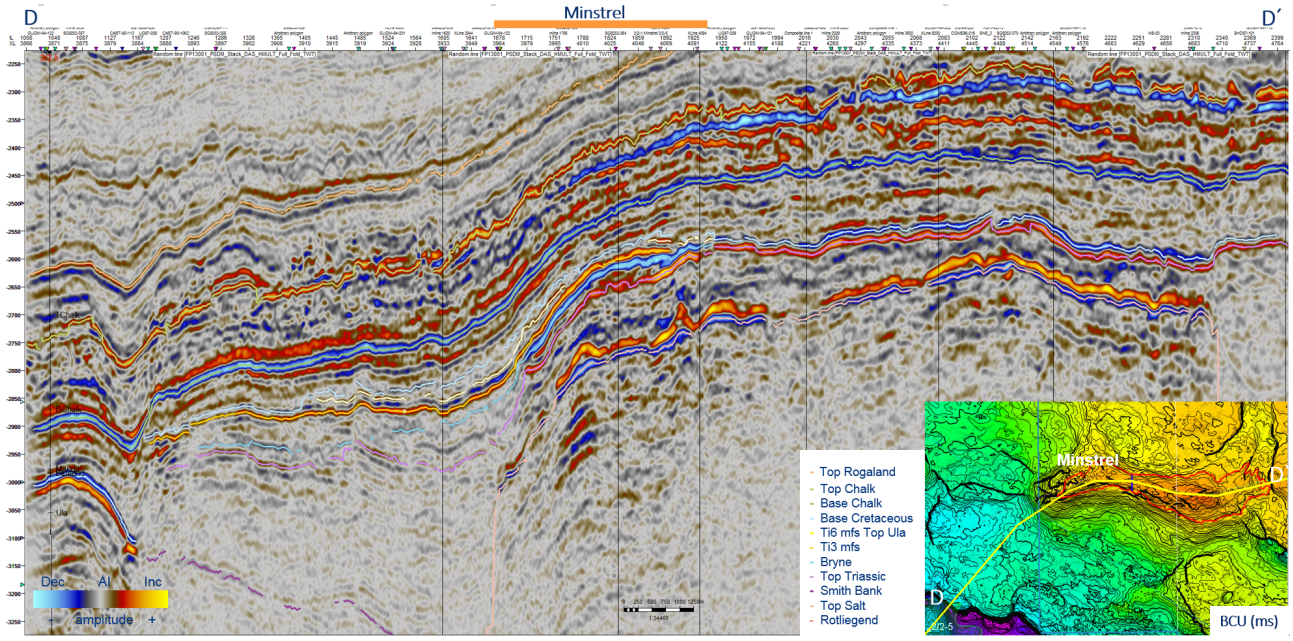

Fig. 4.5 Minstrel prospect seismic section
Upper Jurassic Ula Formation sandstone pinchout over the Minstrel structure on arbitrary line from FP13001 HMULT

Picnic Prospect

The Picnic Prospect is a low relief structure dependent on a fault seal to the east as illustrated in Fig. 4.6. It was regarded as a lead in the application.

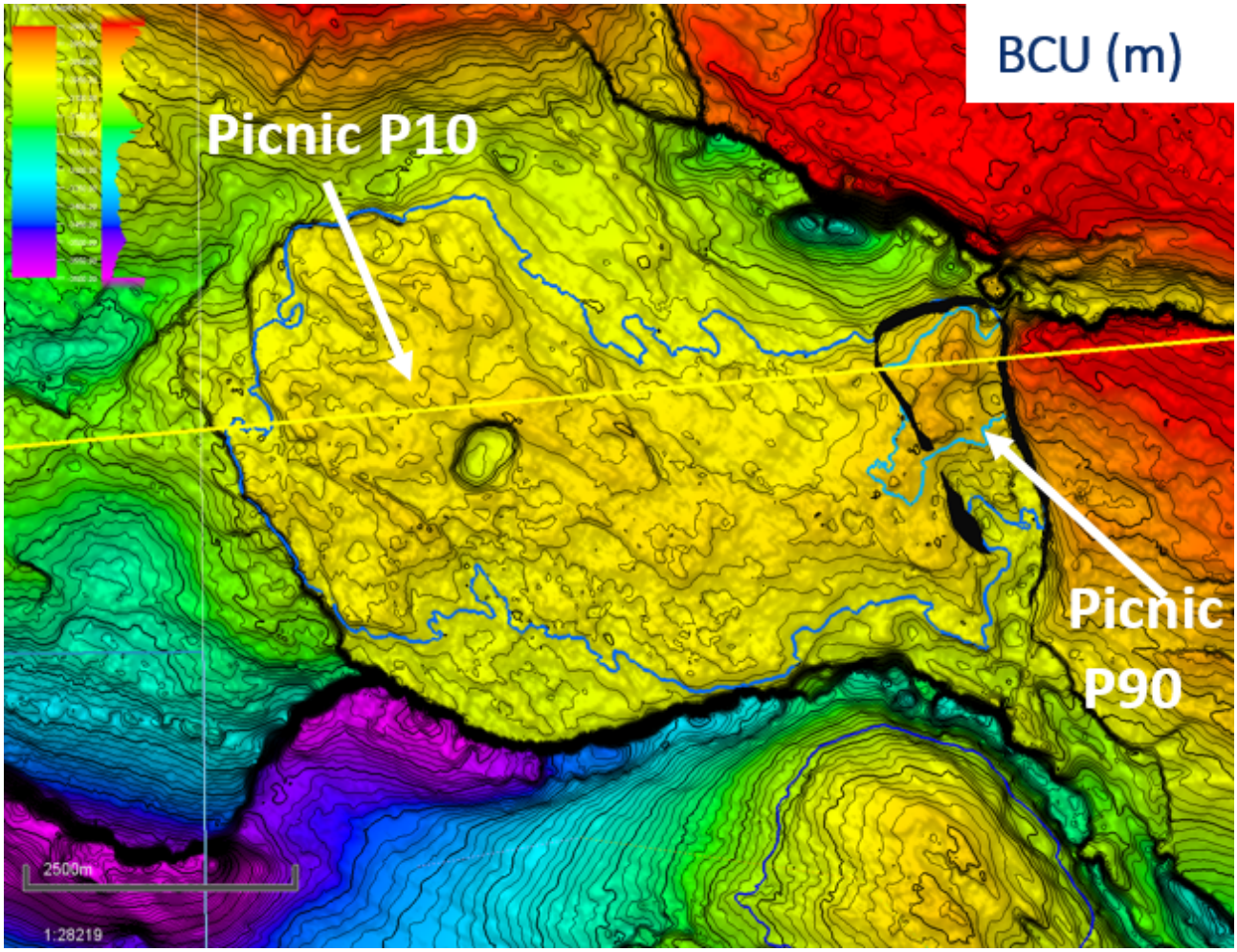

Fig. 4.6 Picnic Prospect
Map showing the outline of the Picnic prospect. The prospect depends on fault seal on the main fault to the east.

- **Trap**
  The trap is defined as an downthrown three-way closure. The structure has low relief making size very sensitive to depth conversion. The Jurassic section thins over the prospect indicating that it was relatively high during the deposition of the Ula sandstone.
- **Reservoir**
  Reservoir is the Upper Jurassic Ula Formation sandstone and reservoir risk is slightly higher then for Cara and Mello.
- **Charge**
  Charge is considered high risk for the Picnic Prospect as it is separated from the basin with a major fault.
- **Seal**
  Top seal is provided by Lower Cretaceous shales and marls. Picnic also requires sideways fault seal as it is a downthrown structure.

Bamsemums Prospect

The Bamsemums Prospect is a structural closure in the Permian Rotliegendes Group, see Fig. 4.7. In the application, the extent of the pure four-way dip closure was considered larger. This changed with the new PSDM seismic as the structure became flatter and the size of the original Bamsemums prospect was significantly reduced. A large upside case was then included to assess the maximum potential of the Rotliegendes in the licence. This Bamsemums Giant is a horst block that requires fault seal. The bounding fault to the south-east has limited throw, although it is part of the main fault geometry in the Permian. The Bamsemums Prospect underlies the Jurassic Minstrel, Cara and Mello prospects.

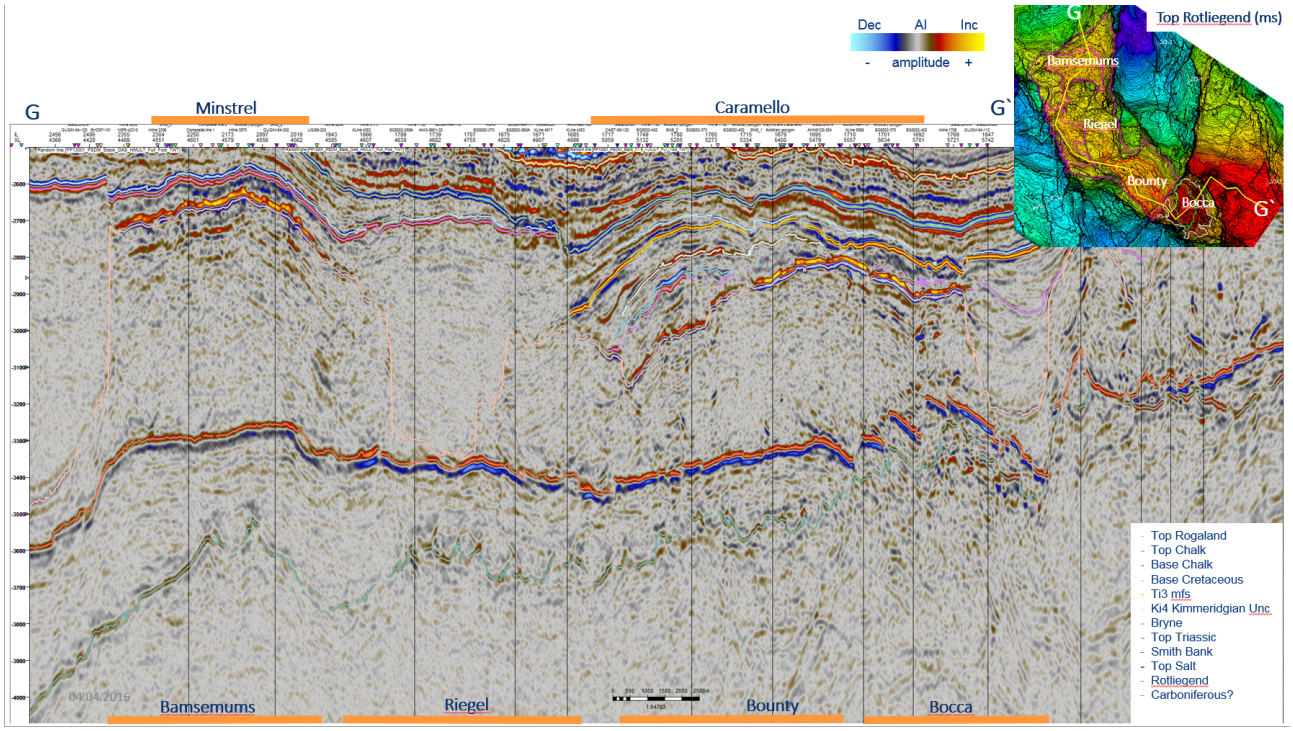

Fig. 4.7 Seismic section trough the Bamsemums Prospect
A big structural closure at Rotligendes level underlying the Jurassic prospects.

- **Trap**
  The trap is defined as a horst block controlled by faults to the east and to the west. The minimum case is reliant on a four-way dip closure while the upside cases are fault dependent.
- **Reservoir**
  Reservoir is the Lower Permian aeolian sandstones of the Rotliegendes Group. The reservoir has been proven in wells 8/10-3, 2/4-17 and 2/4-20. From the parameters in these wells a porosity range of 14-22% is expected in the Bamsemums prospect. Permeability is low for the sands, generally below 100 mD. The regional knowledge and understanding of the sedimentology and reservoir distribution in the Rotliegendes is limited. Cuttings from the wells drilled in the area are degraded due to the drilling method (rock dust) and there are no cores. The recent well 2/4-22 S Romeo discovery is not yet public data.
- **Charge**
  There is a significant source and migration risk for the play. No deep source kitchen has

been proven in the vicinity of the prospect. The well results from nearby 8/10-3 Megalodon are ambiguous and the recent 2/4-22 S Romeo discovery to the west has direct juxtaposition between the reservoir and Jurassic source rocks. A similar structural setting is not present in PL665 S.

- **Seal**
  Top seal is provided by the argillaceous Upper Rotliegendes unit encountered in wells in the area. In addition the Upper Permian evaporites provide an effective seal. The P10 case requires fault seal to the south-east.

Volumes and Risking Summary

Volumes and risk for the prospects are summarised in Fig. 4.8.

	Mmboe Recoverable Resources				Risk	
	Mean	P90	P50	P10	POS	Key Risk
Cara	10,5	8,6	10,4	12,5	0,28	Source
Mello	22,3	4,62	17,90	45,60	0,2	Seal and Source
Minstrel	10,7	7,3	10,5	14,3	0,16	Reservoir and source
Picnic	17,5	3,80	13,10	37,20	0,14	Seal and Source
Bamsemums	319	56	236	699	0,12	Reservoir, source and seal

Fig. 4.8 Volumes and risk
Volumes and risk for the PL665 S prospects.

5 Conclusions

The licensees' evaluation of the data acquired, as a result of the completion of the agreed work programme on PL665 S, is that the potential volumes are significantly reduced and other risks, namely charge and migration, are now too high. Therefore, the licensees have come to a unanimous decision and will not make a commitment to drilling a well and will relinquish the licence.