Status report surrender PL871

Wellesley Petroleum SA

Lotos Exploration and Production Norge AS

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Figures:

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1 History of the PL871 production licence

PL871 was awarded on the 10th of February 2017, in the APA 2016 licensing round. The licence was awarded to Wellesley Petroleum AS, as the licence operator, with partners LOTOS E&P Norge AS, Statoil Petroleum AS and Aker BP ASA holding each 20% equity. In December 2018, AkerBP transferred its 20% equity to Wellesley. On the 10.02.2109 the licence group committed to drill a well on the Balcom prospect and the 25/1-13 well was spudded 10 days later, on the 20th February by the Transocean Arctic rig. The well was completed in 20 days, on the 11th March. It TD'd at 2150m MD in the Paleocene Balder Formation and was P&A'd as a dry well. Equinor Energy AS then transferred its 20% equity in the licence to Wellesley on the 30th April 2019. It was a busy 4 months. The remaining partners were Wellesley with 80% and LOTOS with 20% equity.

At the BoK deadline on the 10.02.2021, Wellesley recommended to let the licence lapse as the work commitments had been fulfilled and the remaining prospects on the licence were small with moderate risk. The confirmation that the licence had lapsed was received from the MPE on the 5th March.

The licence is located on the Frigg Ridge and consists of 150km2 within blocks 25/1,2,4,5 as shown in Fig 1.1

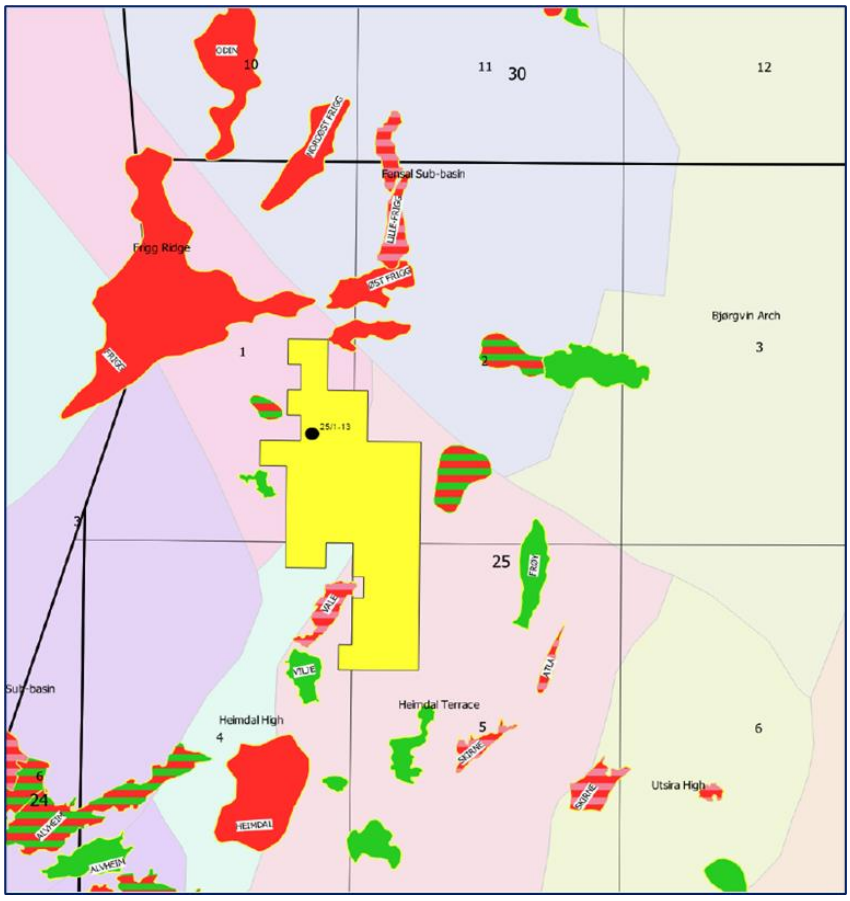

Figure 1.1 Structural Map with Licence area PL871

The PL871 work commitment was reprocessing of 3D seismic with a decision to drill or drop within the first two years.

The licence decision gates for PL871 are presented in Table 1.1.

Table 1.1 PL871 Licence decision gates

Work obligation	Decision	Task status	Expiry date	Wellbore drilled
Reprocessing of 3D seismic		Approved		
	Decision to drill	Will be drilled	10.02.2019	
Drill exploration well		Approved		25/1-13
	(BoK) Decision to concretize	Lapsed	10.02.2021	

Licence meetings

- 2017-03-21-MC PL871 EC/MC meeting
- 2017-11-23-EC-MC PL871 EC/MC meeting
- 2018-02-06-EC PL871 Prospectivity Review
- 2018-04-16-EC Meeting to discuss TechEc evaluation of Balcom
- 2018-05-30-EC-MC PL871 Balcom Drill or Drop Recommendation
- 2018-09-18-EC-MC Meeting to agree sub-surface work program for finalizing Balcom evaluation
- 2018-11-09-MC PL871 MC Meeting
- 2018-12-17-EC Balcom well planning and data acquisition workshop
- 2019-01-16-EC Balcom - DWOP
- 2019-02-22-EC 25/1-13 Balcom TWOP
- 2019-10-29-EC-MC PL871 EC/MC meeting
- 2020-10-29-EC-MC PL871 PL871 EC-MC meeting

The commitment seismic processing was completed in the first year of the licence in 2017. The commitment well 25/1-13 on the Balcom Frigg prospect was drilled in February 2019 and was dry. Post well evaluation and studies were completed, and they demonstrate that a small prospect remains in the Balder interval within the Balcom Central structure. Apart from the Frigg/Balder/Heimdal intervals which were thoroughly reviewed post the well, additional prospectivity in the Jurassic was also reviewed but the 2 prospects identified were concluded to be small with moderate risk. A thorough review of the Skade Formation was undertaken following the trade of the 25/2-21 Liatårnet discovery well. It was concluded that the features with similar seismic attributes to Liatårnet were small and likely to be thin on the PL871 licence. The operator's recommendation was therefore to relinquish the licence as all the licence commitments had been completed.

2 Database overviews

2.1 Seismic data

Although Wellesley had carried out a proprietary 3D merge of 4 exiting 3D datasets covering 1500km2, the partnership elected to purchase 248 km^2 of the new PGS16M01 dataset as the seismic common database for the licence.

Table 2.1 PL871 Seismic database

Survey	NPD ID	Country	Status	Area km^2	Version	Quality
PGS16M01	7377	Norway	Licensed	248 km^2 in common database for PL871	3D Pre-stack and post stack data sets. Merge and reprocessing of MC3D-NVG11, TWT and depth	Very good
WP16M01		Norway	Wellesley merge of NH9603, UHN98, EL9201, EL881 used by WP prior to licence set up but not included in CDB	1500 km^2	3D Pre-stack and post stack data sets.	Very good

2.2 Well data

The well database included 52 wells in the regional database, of which 14 were key wells. Three wells (25/2-1, 25/2-2 and 25/2-3) were also selected to carry out new sampling for biostratigraphy. All the wells were released. The key wells are listed in Table 2.2

Table 2.2 PL871 Key wells (* includes new samples)

Exploration wellbores	NPD ID	Location	Operator	Year drilled	Formations comments	Petro physics	Biostrat	Well tie & Depth Conversion	Rock Physics	Released
25/1-7	463	Frigg Appraisal	Elf Petroleum Norge	1985	Oil & gas in Eocene Frigg Fm	x	x	x		Yes
25/1-9	1001	NW of Balcom	Norsk Hydro Produksjon	1986	Oil and gas in Eocene Frigg Fm	x		x	x	Yes
25/1-11 A	6376	Skogul Appraisal	Det norsk oljeselskap	2010	Oil and gas in Eocene Frigg Fm	x	x	x	x	Yes
25/1-11 R	6368	Skogul Discovery	Det norsk oljeselskap	2010	Oil and gas in Eocene Frigg Fm	x	x	x	x	Yes
25/2-1	353	Øst Frigg Discovery	Elf Petroleum	1973	Gas in Eocene Frigg Fm	x	x*	x		Yes

Exploration wellbores	NPD ID	Location	Operator	Year drilled	Formations comments	Petro physics	Biostrat	Well tie & Depth Conversion	Rock Physics	Released
			Norge							
25/2-2	354	Øst Frigg Appraisal	Elf Petroleum Norge	1974	Oil & gas in Eocene Frigg Fm	x	x*	x		Yes
25/2-3	355	SW of Øst Frigg Field	Elf Petroleum Norge	1974	Dry Balder Fm, Frigg & Danian ssts	x	x*	x		Yes
25/2-9	477	Øst Frigg Appraisal	Elf Petroleum Norge	1985	Oil & gas in Eocene Frigg Fm	x				Yes
25/2-13	1459	Lille Frøy Appraisal	Elf Petroleum Norge	1990	Oil & gas in M. Jurassic Hugin, Sleipner, Statfjord Fms	x	x			Yes
25/2-16S	4385	SW of Lille Frøy	Norsk Hydro Produksjon	2001	Dry M. Jurassic Hugin Fm	x		x		Yes
25/2-17	6215	Frigg Delta Discovery	Statoil Hydro Petroleum	2009	Oil in Eocene Frigg Fm	x	x		x	Yes
25/4-6 S	1703	Vale Discovery	Elf Petroleum Norge	1991	Gas Condensate in M. Jurassic Hugin Fm	x	x	x		Yes
25/5-2	1346	Frøy Appraisal	Elf Petroleum Norge	1989	Gas Condensate in M. Jurassic Hugin Fm	x	x			Yes
25/5-4	1691	Byggve Discovery	Elf Petroleum Norge	1991	Gas Condensate in M. Jurassic Hugin Fm	x	x			Yes
25/5-6	6167	Between Lille-Frøy & Frøy	Lundin Norway	2009	Dry Hermod & Balder ssts	x		x	x	Yes
25/5-7	6423	Alta Discovery	Total E&P Norge	2010	Gas Condensate in M. Jurassic Brent Gp	x			x	Yes

3 Results from geological and geophysical studies

3.1 Pre-well studies:

Seismic reprocessing:
- acquisition of 248 km2 of reprocessed 3D seismic PGS16M01
- coloured inversion of the Horda-Shetland Group interval using wells 25/1-11R, -9, -1 and 25/2-17
- post-migration de-noise workflow

Rock Physics study – results show Class 1 AVA behaviour for both gas and brine bearing Frigg and Heimdal Fm sandstones. Gradients are similar irrespective of reservoir fluid, but intercept will be significantly lower (softer) with gas. Hermod sands have most likely negative intercept (soft) with either reservoir fluid, with slight and most likely undiscernible differences in gradient. Modeling for the Balcom prospect showed similar response on AVA cross-plots to the nearby Nord Øst Frigg and Øst Frigg gas fields. The seismic response at Balcom could be a result of gas presence with a possible gas contact consistent with an observed partial flat event. Direct detection of oil is unlikely but presence of oil leg possible. Hydrocarbon response due to variations in the overburden or reservoir were also evaluated.

Decompaction Study of the Frigg area by Torena using 24/6-1, 251-9 and 26/4-1 wells: Results are that around the Balcom mound the Balder Fm, incl. Odin Fm sands, was deposited extraordinarily fast compared to other Cenozoic intervals. Deposition was as fast as in the thick Heimdal Fm sands further south in Block 24/6 and the Pleistocene Naust Fm clinoforms. It is speculated that this rapid deposition of the Balder Fm and Odin fms caused the extensive remobilization of the Hermod Fm sands in the area, observed as thin-skinned reverse and normal faulting, creating mounds and depressions on the Eocene palaeo-seafloor.

Biostratigraphy study of wells 25/2-1, 25/2-2 and 25/2-3 by RPS Ichron: Results are detailed chronostratigraphic breakdowns over the Rogaland and lowermost Hordaland gps, allowing confident differentiation between the different turbidite depositional systems in the area (Frigg, Odin, Hermod, Heimdal and Ty).

Depositional History, Reservoir Architecture and Sand Remobilization study in the greater Frigg area: Results show that the key processes are deposition and compensational stacking of turbidites, repeated erosion, as well as remobilization and structural growth, all over a background of constant differential compaction. Integrating well and seismic evidence, a set of semi-regional gross depositional environment maps was produced, covering the turbidite depositional systems of the Ty, Heimdal, Hermod/Teal, Odin and Frigg fms.

Inter-Reservoir seal potential study in the Rogaland Gp to Frigg Fm: Based on post-well analyses. Mud gas data were integrated, providing information on both shows and vertical seals. Results show that working inter-formational seals can be demonstrated only in the Heimdal Fm. Top-seal chance of success remains low in the Hermod and Ty fms, especially where seismic scale remobilization can be observed

3.2 Post-well Studies

Multiple studies were conducted following the drilling of the Balcom well, 25/1-13, as part of the post-well analysis. These included cuttings analyses, biostratigraphy, geochemistry and SpecCam. Additionally, Geoflex and HCS studies were completed

Biostratigraphy: by RPS-Ichron to incorporate the new well into the established biostratigraphic framework. Results show that, according to prediction, substantial amounts of Frigg Fm sand were encountered by the well, even though located on the Balcom mound and not in a depocenter. As predicted, the well TDed in Odin sandstones.

Geochemistry: During drilling, no oil shows were observed in the well apart from very pale slow blooming dark yellow cut fluorescence in the first sandstone sample from the Frigg Formation at 2063m. To assess the gas composition in the mud gas, canned cuttings and isotubes samples were acquired at the wellsite. They have a carbon isotope signature pointing towards a gas mix of thermogenic gas on the one hand and microbial gas from biodegradation of petroleum on the other. In cuttings extracts only OBM contamination could be detected.

SpecCam - Spectra Map, 2019. Infra-red Spectroscopy to assess the mineralogy, especially clay composition, and hydrocarbon shows. Results show that the acoustically harder lowermost Horda Fm shale is enriched in detrital illite relative to the overlying smectite dominated Horda Fm. This is in line with the pre-drill interpretation of a Frigg-equivalent shale interval with a unique clay mineralogy, related to contributions of detrital material from turbidity currents depositing the Frigg Fm sands elsewhere. However, pre-drill, the detrital clay mineral was assumed to be kaolinite. The lowermost Horda Fm shale is also associated with a striking peak in phengite content.

HCS – Study performed by Weatherford and interpreted by IFE (Kjeller) involving screening cuttings for hydrocarbon shows. The method is based on Fluorescence Emission Spectroscopy, recording the quantity and composition of polycyclic aromatic hydrocarbons, contained in all liquid hydrocarbons. Results show potential oil shows in non-reservoir lithology at two points in the overburden. Responses over the Frigg and Odin fms are below the detection limit of the method. However, a systematic increase of the HCS response lends some support to a paleo-OWC at about 2096mMD.

4 The Balcom prospect and Exploration Well 25/1-13

The Balcom Prospect is a robust four-way structure mapped on PGS16M01, present in time and depth. The prospect consisted of three interconnected structural culminations, of which the western structure was estimated to have the greatest chance of good reservoir quality Frigg and Odin Formations sandstones, and also the greatest volumetric potential, Fig. 4.1. It is located on the same Frigg Fm lobe as drilled by 25/1-9 but in a more distal position. The deposition of the Odin and Frigg formations are affected by growth mounding and for this reason, West Balcom was targeted by the 25/1-13 well as Central Balcom had a higher risk of thin Frigg sand development over a mounded Odin sand. The Horda Fm fast shale does not act as waste zone for the HCWC in offset wells, so the prospect was defined by Top Frigg sandstone map. The Frigg and Odin formations were considered to be in communication.

Pre-drill well based modelling suggested a Class I AVA behaviour expected in the presence of gas with 35-55% relative dimming and potential for phase reversal. The relative amplitude changes between brine and oil cases are very small (5-15 %), but intercept is significantly higher than in the gas case. Seismic observations were a relative dimming on prospect vs off prospect (anomalous behaviour) with moderate class I AVA behavior within the prospect (5-35ºϴ). This behaviour was consistent with other discoveries in the area. Furthermore, a flat event was observed within the prospect. These seismic observations could most simply be explained by the presence of gas. An oil leg was considered probable given that most discoveries in the area had one and the pre-drill depth of the OWC was taken to be the spillpoint on the Top Frigg Sandstone depth map.

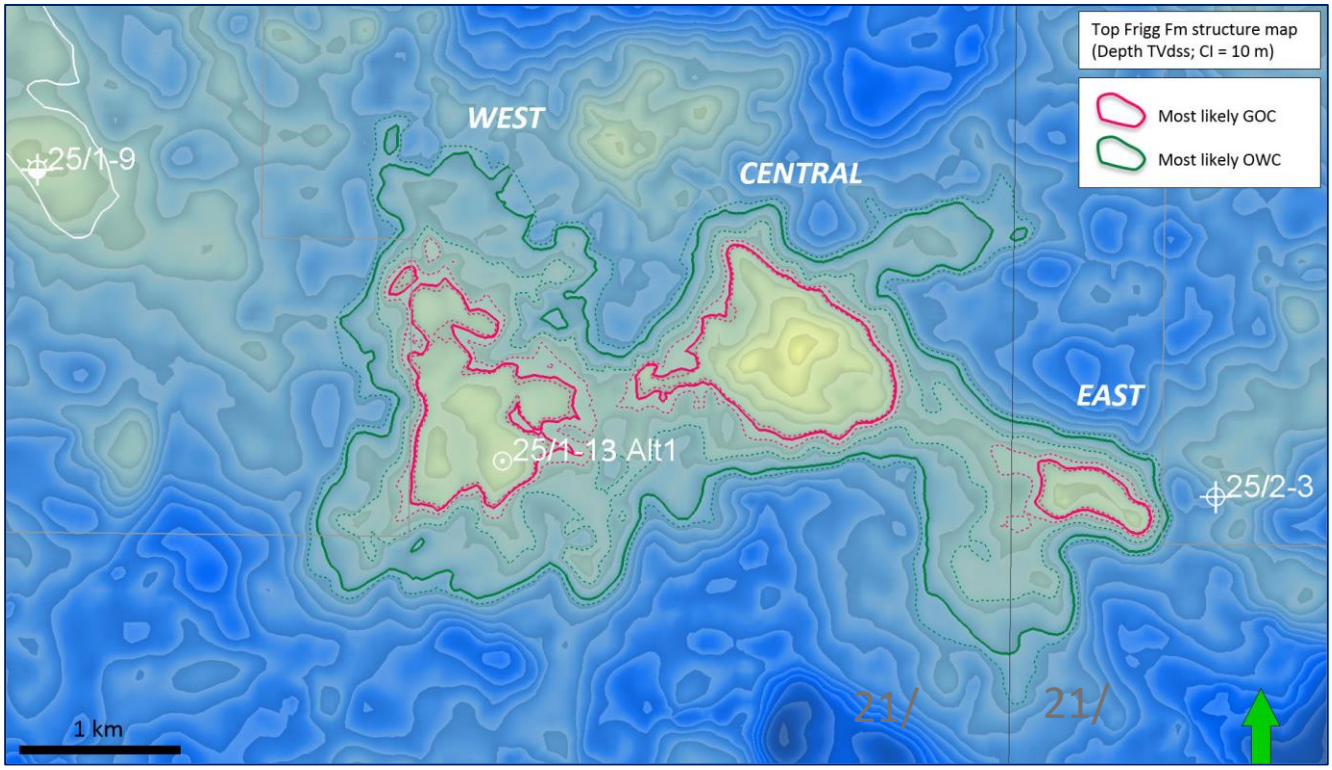

Figure 4.1 Top Frigg Fm Structure Map of the Balcom prospect.

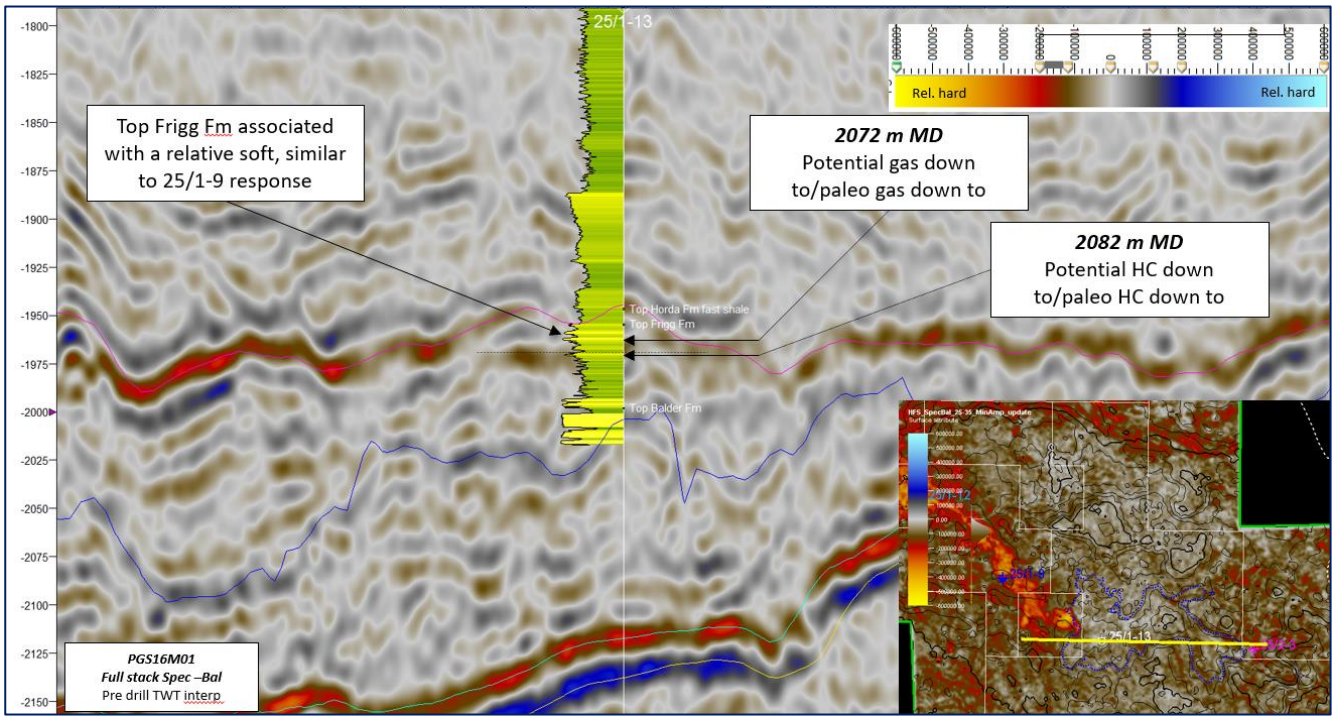

Figure 4.2: Seismic Line showing 25/1-13 well on Balcom West Prospect

The 25/1-13 well on the Balcom West prospect was spudded from the Transocean Arctic on 20th February 2019 in a water depth of 109 m MSL and reached a total depth of 2150 m (-2126 m TVD SS) in the Balder Formation, on March 4th 2019. A 9 7/8" pilot hole was then drilled from 197 m to 1059 m to check for any shallow gas. No indication of any shallow gas was observed. The well encountered the Frigg formation with a thickness of about 50 metres, with water-bearing sandstone layers totalling 10 metres, mainly with good reservoir quality. The reservoir N/G at the top of the Frigg Fm was close to the P90 pre-drill estimate. About 40m of the underlying Balder formation was drilled, containing 20 meters water-bearing Odin sandstone with good to very good reservoir quality.

An increase in mud gas was seen at the top Frigg Formation in silty sandstones (5 metres of net sandstone) with a max peak of 1.92 % at 2070 m MD above a background of 0.5%. Gas, live or residual, down to the 2072m MD coincides with the flat seismic flat event observed pre-drill may be a DHI (figure 4.2). No oil shows were observed in this well beside some rare, very pale slow blooming dark yellow cut fluorescence in the first sandstone sample from the Frigg Formation at 2063 m. However, below the interval with elevated mud gas an OWC may be seen at 2082 mMD, based on a subtle drop in resistivity over a porous sandstone interval. There is weak evidence from the HCS study for a paleo-OWC at around 2096mMD. The well was classified as dry.

Provided live gas and oil columns were discovered in the 25/1-13 well, the remaining potential in the Balcom West structure is 2,4 Mmboe. Additional remaining potential is possible in Balcom Central where the well-developed Odin Formation sandstones intersected in the 25/1-13 well are mapped above the possible HCWC's. Recoverable volumes in the Odin Formation are small at around 2 Mmboe (fig 4.3)

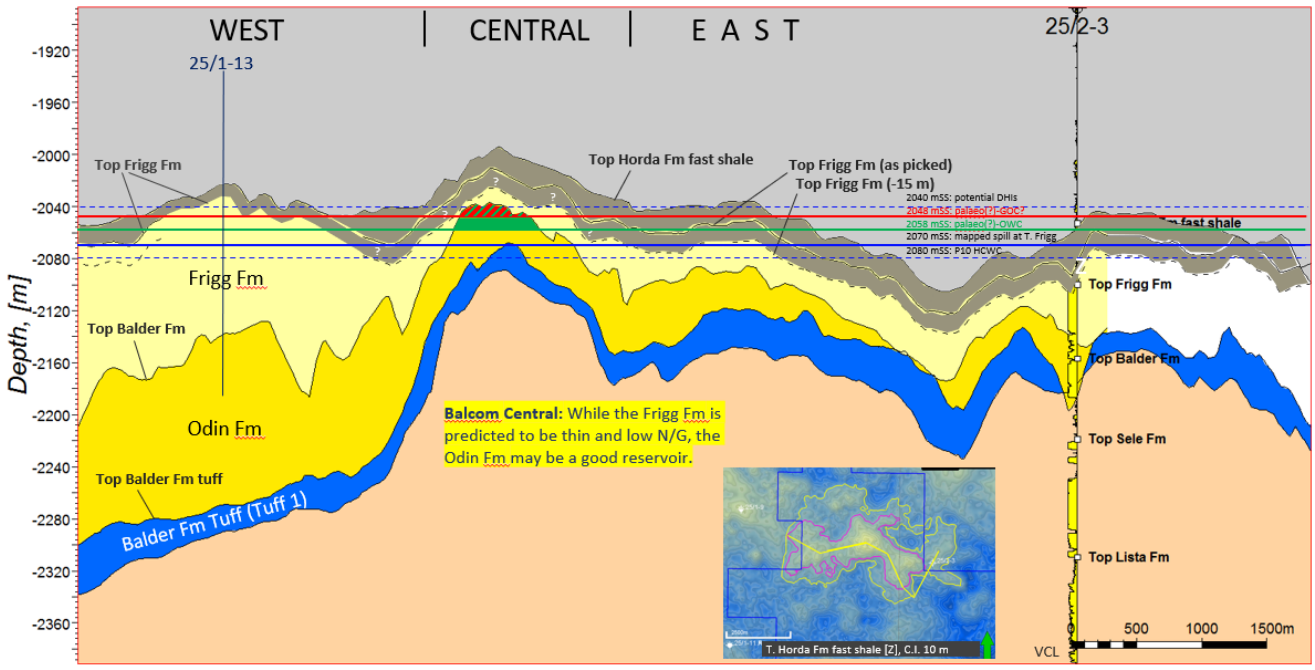

Fig. 4.3 Balcom Central Prospect geo-section.

5 Prospect update report

Additional Jurassic structures, the Corrigan North, South and West prospects were mapped in the licence. These were not considered for drilling due to a combination of high risk on fault seal, moderate volumes, and deep reservoirs.

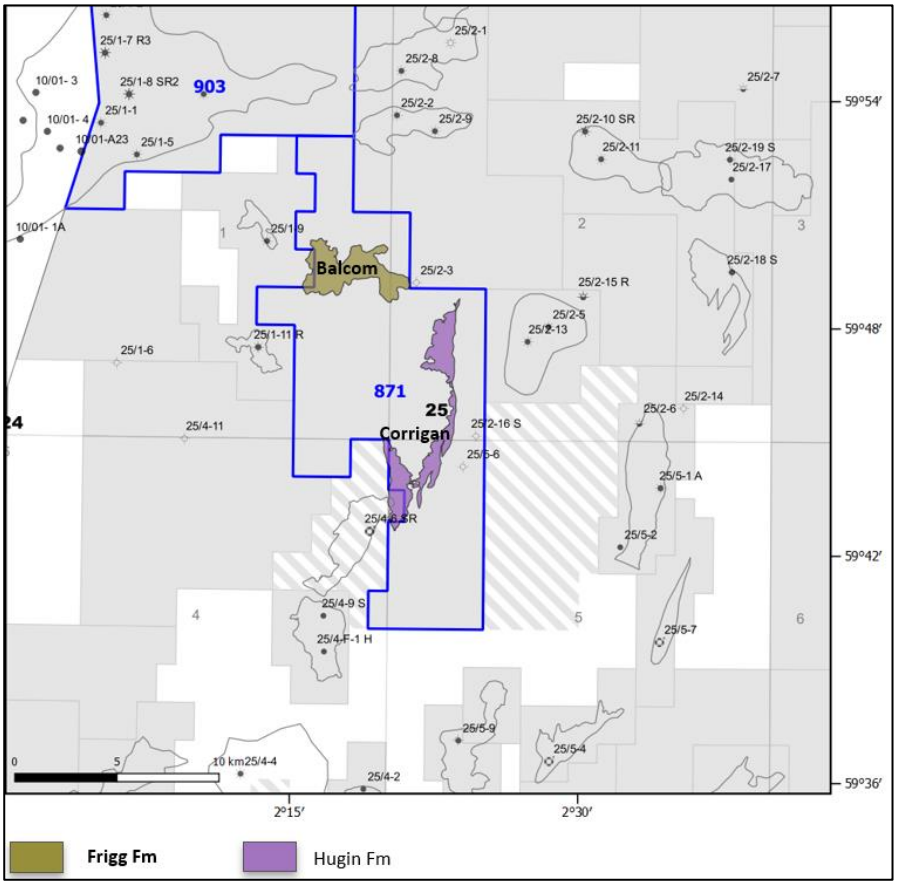

Fig. 5.1 License area PL871 with Corrigan prospect outlines

5.1 The Corrigan Prospects:

The prospects are Hugin hanging-wall traps, downfaulted from the Vale Field. They were interpreted on the de-noised PGS16M01 seismic (figure 5.2). The Corrigan N and S prospects are bounded to the east by a large fault with a large predicted pressure increase basin-ward, across the fault. The western bounding fault to the Corrigan W prospect, separating it from the Vale Field is a more complex set of faults, but may also be a significant pressure barrier. The aquifer pressure in the Corrigan block may be at similar pressures as the Vale-Heimdal pressure cell, but it may equally if not more likely be intermediate between Vale/Heimdal in the west and Lille Frøy to the east. This latter case would imply less fault seal risk for the Vale fault then the Corrigan fault due to a pressure seal component (figure 5.3). Top seal is provided by the generating Heather and Draupne Formations.

The reservoir is the Hugin Formation in the depth range from 3800 to 4000 meters. The reservoir is expected to be around 140 m thick with N/G in the range of 60 to 85%. At this depth, the reservoir properties are expected

to be moderate with porosities around 19% but low permeabilities in the range of 0.1 to 10 mD.

The Draupne and Heather source rocks are in the main oil generation window around Corrigan. The local fetch area for the Corrigan prospects is limited in size and may or may not be sufficient to fill the prospects to spill. While the deep Viking Graben to the west is generating significant volumes of hydrocarbons, dependence on migration from this kitchen would add prospect risk. Gas/condensate is the expected hydrocarbon phase in either case.

The depth contour separating the 3 prospects is 4065m and is taken as the most likely spillpoint for the structures. The ultimate spillpoint for all 3 structures is at 4099m where the Corrigan N trap spills northwards (fig 5.3). This has been used to define the P10 volumes. The mean recoverable volumes for the Corrigan North prospect is 22 Mmboe, Corrigan South is 38 Mmboe and Corrigan West 37 Mmboe. The risk on Corrigan West is considered to be the lowest with a GPoS of 0.26 due to potential pressure sealing towards the Vale/Heimdal pressure cell, while Corrigan North and South have more risk with a GPoS of 15%. Highest risk on all the prospects is seal/retention (across-fault or along-fault leakage) followed by charge from local kitchen. Corrigan West is considered to be the best prospect in terms of volumes and risk, but the crest lies in the adjacent PL249 Vale licence, and only 9,3 Mmboe (25% of the mean volume) lie within PL871.

A single combined Corrigan prospect with a common spillpoint of 4099m is an upside case (blue contour on the map in figure 5.3. Recoverable volumes in this upside case are >100 Mmboe but the CoS is estimated to be below 5%.

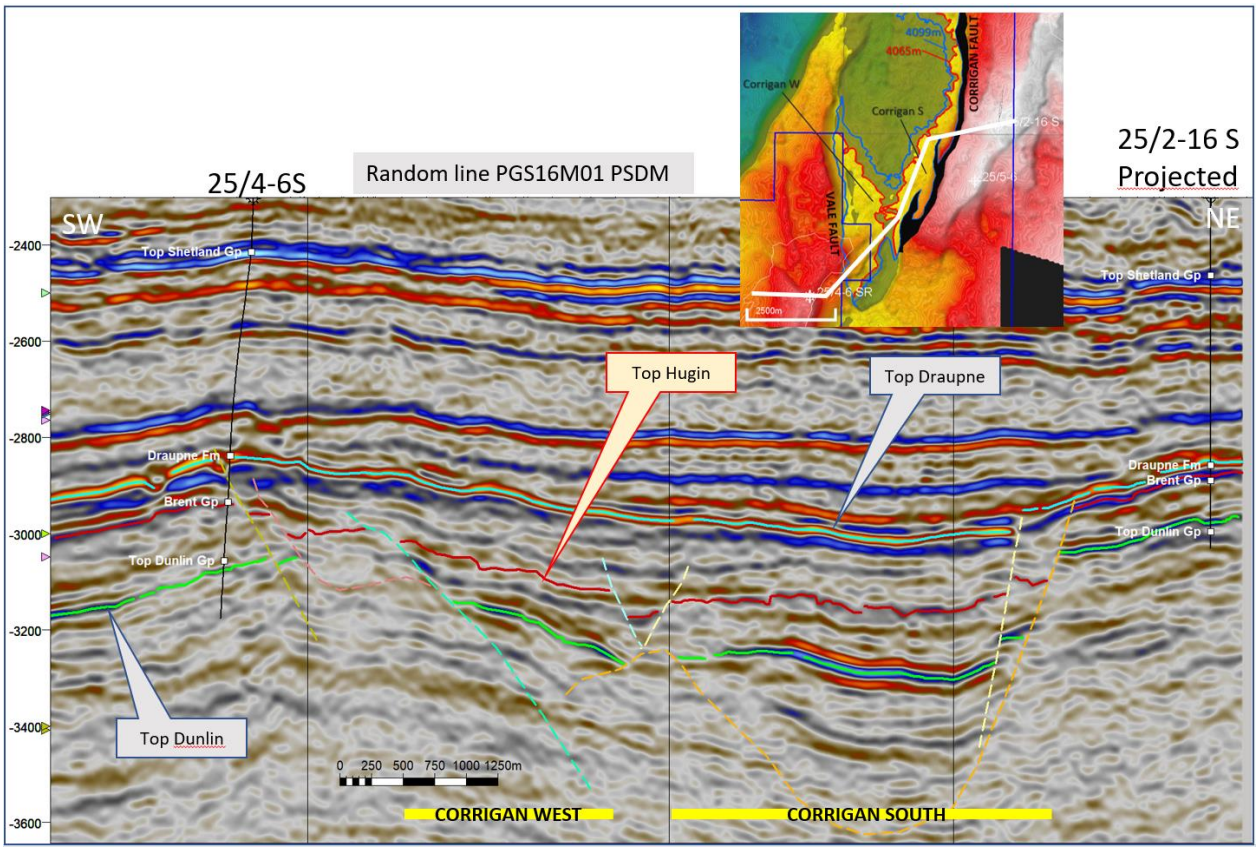

Fig. 5.2 Seismic Line through Corrigan W and Corrigan S Prospects

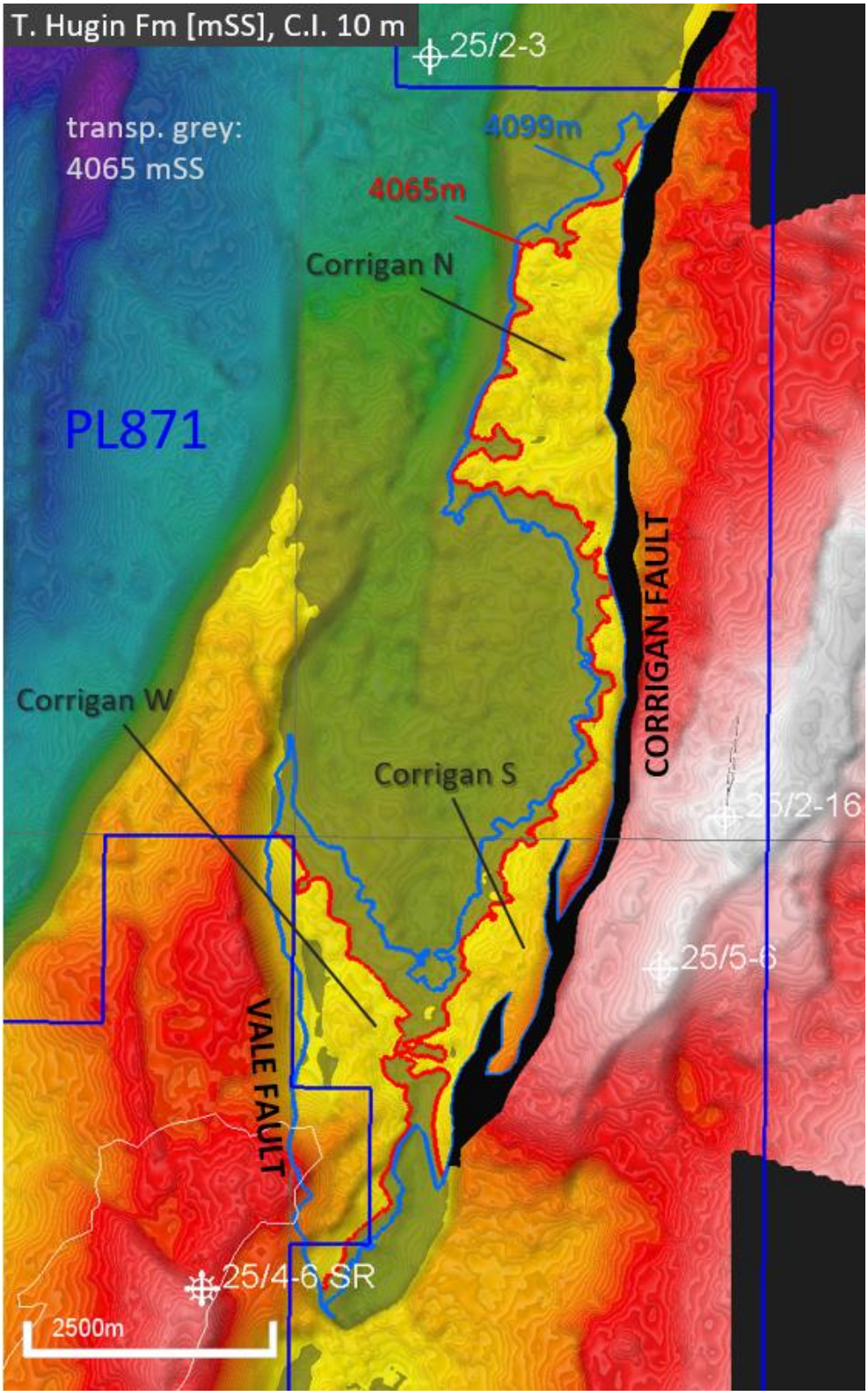

Fig. 5.3 Depth Map to Top Hugin showing Corrigan prospect outlines

6 Technical evaluation

Technical assessment of the Corrigan prospects was carried out. For the Corrigan N and S prospects the risk on seal was considered to be a ‘killer risk’ at 20% chance. For the Corrigan West prospect, risks are acceptable but the crest of the structure and 75% of the mean recoverable volumes lie within the neighbouring PL249 licence, which makes the prospect in PL871 too small to take a drill decision on.

7 Conclusion

No prospectivity with acceptable volume and risk has been identified following the Balcom West 25/1-13 well.

8 References