PL913 & PL913 B

Surrender Report

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1 KEY LICENSE HISTORY

Summary

Production Licenses (PL) 913 & 913 B, are located in the South Viking Graben, North Sea and are comprised of block 24/12, block 24/11 and block 15/3 (Figure 1.1). The license PL913 was awarded on March 2nd, 2018, as a part of the 2017 APA Round. The extension license PL913 B was awarded on March 1st, 2019, as part of the 2018 APA Round. The initial period for both licenses was valid until March 2nd, 2025. The license partnership consisted of OMV (Norge) AS (Operator) and Repsol Norge AS. The license interest between the companies was as follows:

- OMV (Norge) AS - 50%
- Repsol Norge AS - 50%

The initial work programme to evaluate the license was as follows:

- Phase 1 - Within two years (by March 2nd 2020) reprocess 3D seismic data within the license and make drill or drop decision.
- Phase 2 - Within two years (by March 2nd 2022) drill exploration well.

Work Commitment

The work programme for the initial phase of the license was fulfilled by the reprocessing and merging of two 3D seismic cubes with a combined total area of ca 730 km^2. The area of reprocessing was considerably larger than the license area of ca 250 km^2.

Meetings held

During the lifecycle of PL913 & PL913 B a number of meetings were held between the licensees. A list of these meetings can be found below:

- 21.03.2018 - EC / MC Meeting
- 25.06.2018 - EC / MC Meeting
- 19.11.2018 - EC / MC Meeting
- 20.12.2018 - EC Work Meeting
- 20.06.2019 - EC / MC Meeting
- 10.09.2019 - EC Work Meeting
- 22.10.2019 - EC Work Meeting
- 28.11.2019 - EC / MC Meeting

Reasons for license relinquishment

The initial phase of the work programme was completed by creating a high quality 3D seismic survey through reprocessing and merging. The Operator has also conducted several G&G studies on behalf of the partnership, including: 3D source and migration modeling, rock physics modelling, seismic inversion feasibility study, seismic gather analysis, and regional pressure analysis. The aim of the work programme was to mature the main prospect Satriani towards a drill or drop decision. In addition several Upper Jurassic leads were mapped and analyzed. However, the volume potential currently recognized within PL913 & PL913 B is not sufficient for a positive drill decision. The license Management Committee has therefore concluded to surrender the license.

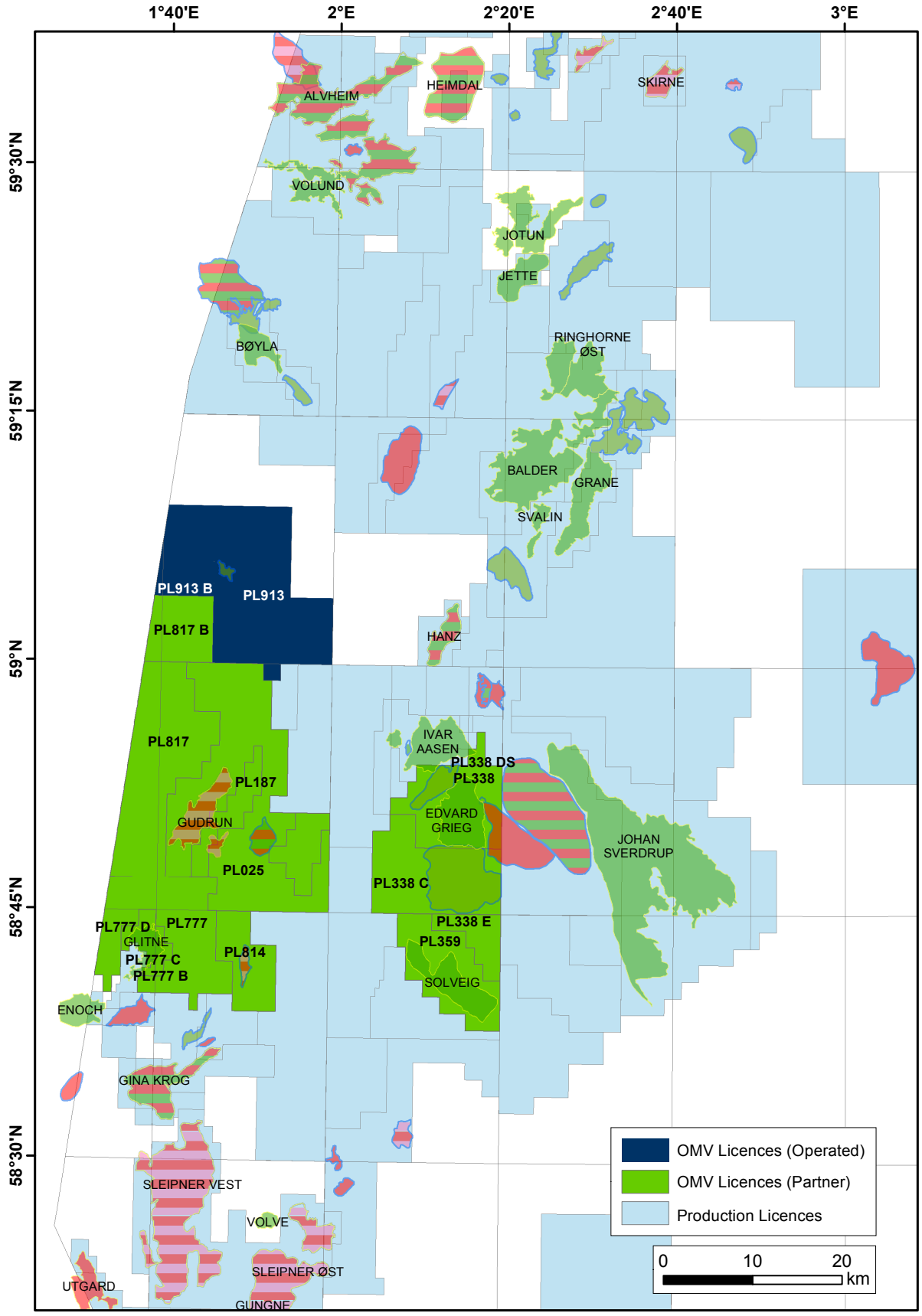


Figure 1.1 Overview Map South Viking Graben Area (North Sea)

2 DATABASE

Seismic data

The common seismic database is comprised of the multiclient dataset PGS16M04. For the license common database the survey was cropped to range from Inline 32753 to 36368, crossline 124649 to 132978, the remaining area is approximately 658 km^2. The data quality is considered as good to very good. However, the objective of this dataset is to provide good quality data on a regional scale. It was decided to reprocess and merge the underlying Geostreamer data (MC3D-Q162013, MC3D-SVG11) in order to provide the best possible data on prospect scale, and to provide data reliable for subsequent AVO analysis and inversion studies.

The resulting dataset is the reprocessed OMV19M01, where the data quality is considered to be excellent. The area of this dataset was slightly extended towards the south, in order to be able to fully evaluate the water wet Ty reservoir system penetrated by well 15/3-2 R. The total area of OMV19M01 is approximately 730 km^2.

The complete list of seismic cubes in the common database can be found in Table 2.1 and the location of the surveys in Figure 2.1.

Well data

The well database is summarized in Table 2.2 with the locations in Figure 2.1. Four wells in particular (15/3-2 R, 24/12-1 R, 24/12-3 S, 24/12-6 S) were essential to understand the stratigraphy in the area and to constrain the trap of the main prospect Satriani. In addition, wells 24/12-6 S, 24/6-2 (Heimdal), 24/9-9 S (Bøyla) and 15/5-5 (Glitne) were important for understanding seismic amplitude behaviour of Paleocene formations. These wells were key in constraining the geophysical studies carried out in the license such as seismic modelling and AVO analysis.

Table 2.1 Seismic Database

Survey	Survey Input	NPDID	Market Availability	Inline Range	Xline Range	Vintage	Area [km2]	Quality
PGS16M04-PGS16910VIK	MC3D-Q162013, MC3D-SVG11	7782, 7378	Multiclient	32753 - 36368	124649 - 132978	2017	658	Good to very good
OMV19M01	MC3D-Q162013, MC3D-SVG11	7782, 7378	License Owned	10542 - 12954	4376 - 7032	2019	724	Excellent

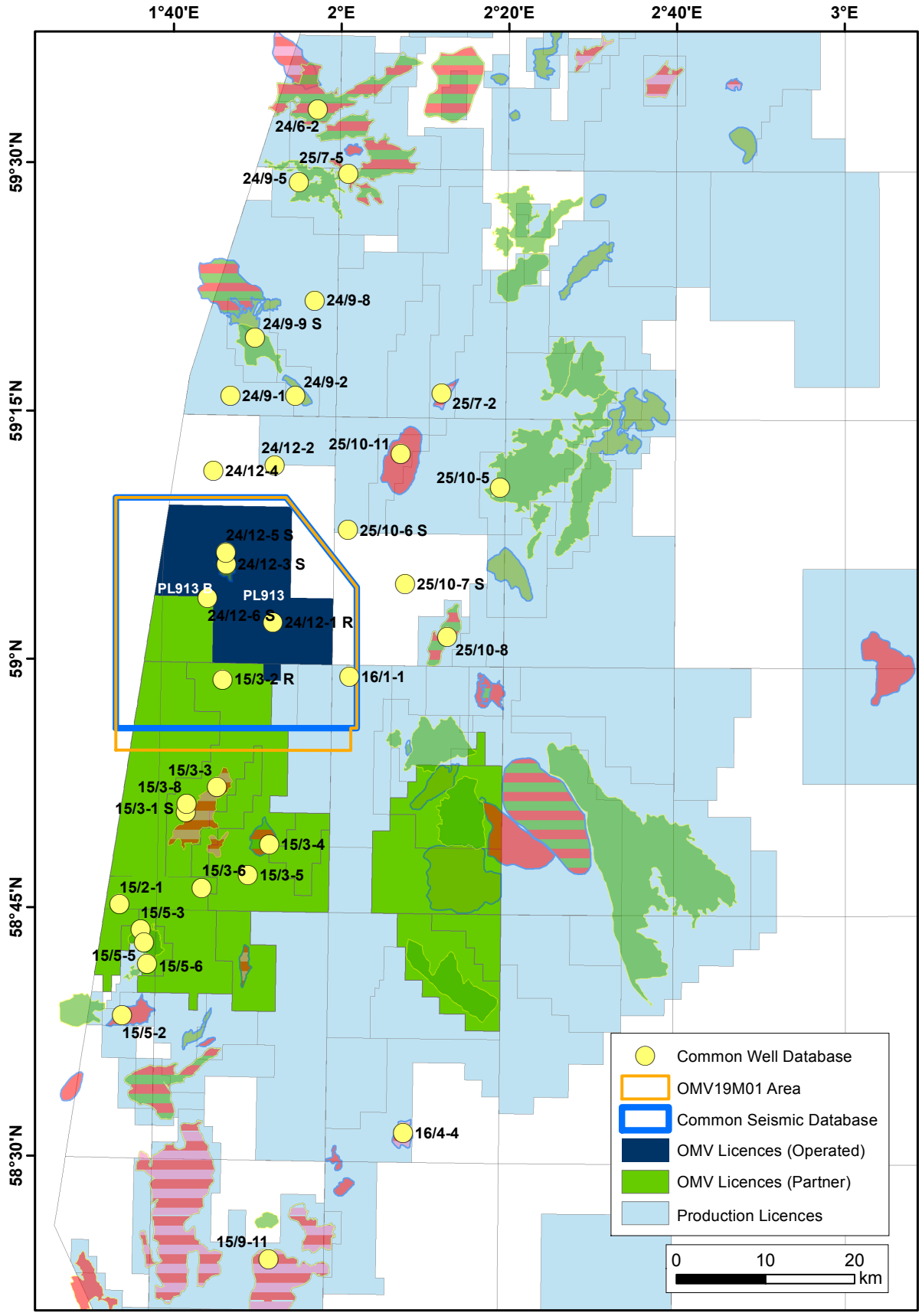


Figure 2.1 Seismic and Well Database Location Map

Table 2.2 Well Database

Well	Completion Year	Operator	Well Result Paleocene	Depth (mTVD)	Age at TD	Comments
15/2-1	1982	Norsk Hydro Produksjon AS	DRY	4600	LATE PERMIAN	Target: Jurassic. Good reservoir properties in Paleocene.
15/3-1 S	1975	Elf Petroleum Norge AS	DRY	5129	MIDDLE JURASSIC	Target: Jurassic. Good reservoir properties in Paleocene. Clean sst in Ty Fm.
15/3-2 R	1977	Elf Petroleum Norge AS	DRY	4990	MIDDLE JURASSIC	Target: Jurassic. Lateral pinch-out of reservoir. Penetrated younger Ty channel.
15/3-3	1979	Elf Petroleum Norge AS	DRY	5112	TRIASSIC	Target: Jurassic. Fair reservoir properties in Paleocene.
15/3-4	1982	Elf Petroleum Norge AS	DRY	4259	TRIASSIC	Target: Jurassic. Reservoir presence in Paleocene.
15/3-5	1984	Elf Petroleum Norge AS	DRY	4130	MIDDLE JURASSIC	Target: Jurassic. Reservoir Presence in Paleocene.
15/3-6	1999	Amoco Norway Oil Company	DRY	2786	LATE CRETACEOUS	Target: Paleocene. Good reservoir properties in Paleocene.
15/3-8	2006	Statoil ASA	DRY	4591	LATE JURASSIC	Gudrun Appraisal well. Reservoir presence in Paleocene.
15/5-2	1978	Norsk Hydro Produksjon AS	DRY	4322	TRIASSIC	Target: Jurassic. Reservoir Presence in Paleocene. No trap
15/5-3	1980	Norsk Hydro Produksjon AS	DRY	5031	DEVONIAN	Target: Triassic. Good reservoir properties in Heimdal.
15/5-5	1995	Norsk Hydro Produksjon AS	OIL	2636	PALEOCENE	Target: Paleocene. Good reservoir properties in Paleocene. Glitne field.
15/5-6	1997	Den norske stats oljeselskap a.s	OIL	2725	PALEOCENE	Target: Paleocene. Good reservoir properties in Paleocene. Struc. trap.
15/9-11	1981	Den norske stats oljeselskap a.s	GAS/CONDENSATE	2950	TRIASSIC	Target: Paleocene. Good reservoir properties in Heimdal. Struc/Strat trap .
16/1-1	1967	Esso E&P Norway A/S	DRY	3203	LATE CRETACEOUS	Target: Paleocene. Good reservoir properties in Heimdal. Strat/pinch-out trap.
16/4-4	2007	STATOIL	GAS/CONDENSATE	2409	LATE CRETACEOUS	Target: Paleocene. Good reservoir properties in Paleocene.
24/6-2	1998	Norsk Hydro Produksjon AS	OIL/GAS	2705	PALEOCENE	Target: Paleocene. Good reservoir properties in Paleocene. Struc. trap.
24/9-1	1976	Conoco Norway Inc.	OIL SHOWS	4907	LATE JURASSIC	Target: Jurassic. Reservoir Presence in Paleocene. No trap
24/9-2	1977	Conoco Norway Inc.	OIL SHOWS	2206	LATE CRETACEOUS	Target: Paleocene. Reservoir presence in Paleocene. Struc. trap.
24/9-5	1994	Fina AS	OIL	2860	LATE CRETACEOUS	Target: Paleocene. Oil in intra-Balder sst.
24/9-8	2007	Det Norske Oljeselskap AS	DRY	2190	PALEOCENE	Target: Paleocene. Good reservoir properties in Heimdal. Struc. trap.
24/9-9 S	2009	Marathon Petroleum Norge AS	OIL	2226	PALEOCENE	Target: Paleocene. Good reservoir properties in Heimdal. Bøyla field.
24/12-1 R	1978	Den norske stats oljeselskap a.s	DRY	4825	TRIASSIC	Target: Jurassic. Stratigraphic pinch-out of reservoir sands.
24/12-2	1982	Den norske stats oljeselskap a.s	SHOWS	5091	LATE JURASSIC	Target: Jurassic. Good reservoir properties in Paleocene.
24/12-4	2001	Statoil ASA	DRY	2265	PALEOCENE	Target: Paleocene. Dry Hermod and Heimdal sands.
24/12-3 S	1996	Den norske stats oljeselskap a.s	OIL	2726	PALEOCENE	Target: Paleocene. Good reservoir properties in Paleocene. Oil in Heimdal.
24/12-5 S	2007	Noil Energy ASA	DRY	2239	PALEOCENE	Appraisal: Paleocene. Good reservoir properties in Paleocene. Struc. trap.
24/12-6 S	2010	Det norske oljeselskap ASA	DRY	5076	MIDDLE JURASSIC	Target: Jurassic. Penetration of Ty sands within prospect.
25/7-2	1990	Conoco Norway Inc.	DRY	4847	MIDDLE JURASSIC	Target: Jurassic. Good reservoir properties in Paleocene.
25/7-5	1997	Norsk Hydro Produksjon AS	OIL	2735	PALEOCENE	Target: Paleocene. Good reservoir properties in Paleocene. Struc/Strat trap.
25/10-5	1981	Esso E&P Norway A/S	DRY	2011	LATE JURASSIC	Target: Eocene. Good reservoir properties in Heimdal. Strat/pinch-out trap.
25/10-6 S	1996	Den norske stats oljeselskap a.s	DRY	4281	MIDDLE JURASSIC	Target: Paleocene. Good reservoir properties in Paleocene. Struc/Strat trap.
25/10-7 S	1996	Esso E&P Norway A/S	DRY	2582	PALEOCENE	Target: Paleocene, lower Eocene. Dry Heimdal sst, lower Eocene limestones.
25/10-8	1997	Esso E&P Norway A/S	OIL/GAS	2653	EARLY PERMIAN	Target: Multiple. Dry Heimdal sst, oil/gas in Up. Jurassic, M. Jurassic & Permian dry.
25/10-11	2011	Marathon Petroleum Norge AS	DRY	4560	JURASSIC	Target: Jurassic. Reservoir presence in Paleocene.

3 REVIEW OF GEOLOGICAL AND GEOPHYSICAL STUDIES

Exploration within PL913 was largely driven by seismic amplitude anomalies. Consequently, the main components of the license's geological and geophysical work programme were focussed on seismic reprocessing, interpretation and analysis. Utilizing this reprocessed dataset several geophysical studies were undertaken, including: rock physics modelling, seismic inversion feasibility, and pre-stack gather analysis. Geological studies were catered towards the main prospect on the license which was Satriani. This mainly consisted of 3D source and migration modelling and regional pressure analysis with the emphasis on unstanding the connectivity of Paleocene sandstones of various formations, and thus assesing the seal risk.

Geological Studies

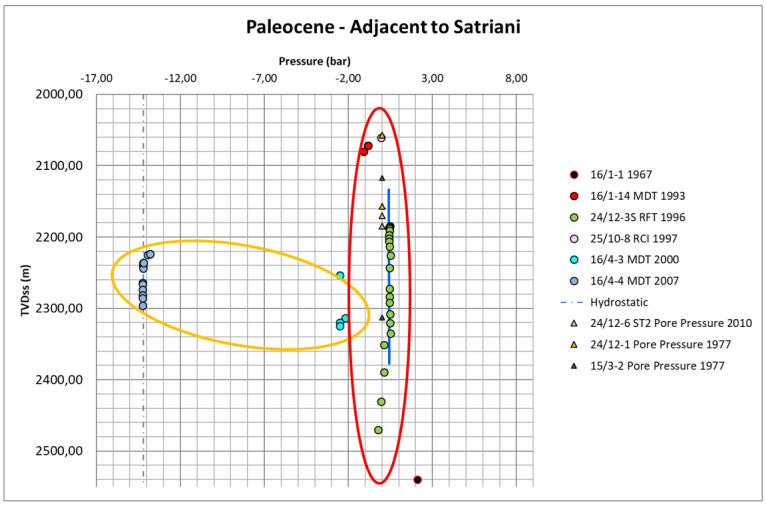
Basin modelling

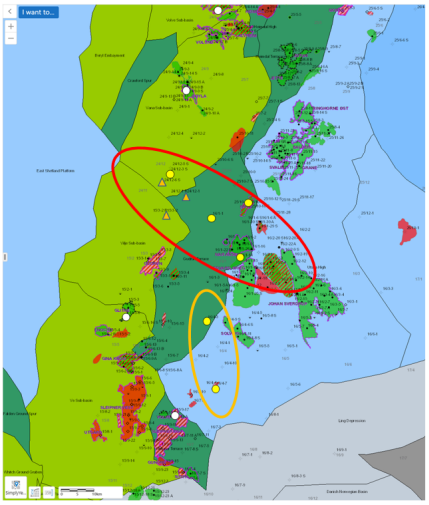
A 3D source and migration study has been performed to investigate the possibility of hydrocarbons migrating from the Jurassic Draupne and Heather formations into the Satriani trap. The source rocks have been found to be mature and expelling significant volumes from the time of trap generation. Migration scenario modelling suggests that in most cases the Satriani trap can be filled.

Regional pressure analysis

A regional pressure study has been conducted on Paleocene sandstones across the South Viking Graben (Figure 3.1). Two important observations have been made, analyzing datapoints from multiple wells. First, the wells adjacent to Satriani exhibit the same static pressure. Second, pressure drawdown in the Paleocene from producing fields can be observed over great distances. Therefore, it can be concluded that Paleocene reservoirs in the area are very well connected, due to the abundant presence of sands and vertical sand injections. This significantly reduced the chance of effective intra-formational seals and, thus, working strathigraphic trapping mechanisms in the lower Paleocene. Confirming this statement is the fact that all Paleocene hydrocarbon discoveries of the South Viking Graben have been made in the uppermost sands.

- The immediate adjacent wells, essentially all have the same static pressure.
- Wells 16/4-3 & 16/4-4 are not connected to Satriani. Both show a pressure drawdown as a result of the Sleipner East production (production start 1987).
- Bøyla 24/9-9S & 24/6-2 Alvheim are both pressure depleted due to production in Heimdal (1981 production start).
- Hanz 25/8-5S is depleted in pressure possibly due to production from Jotun and Balder (both production start in 1995).
- The Glitne 15/5-5 shows interpreted virgin pressure for Plaeocene sands in the area.





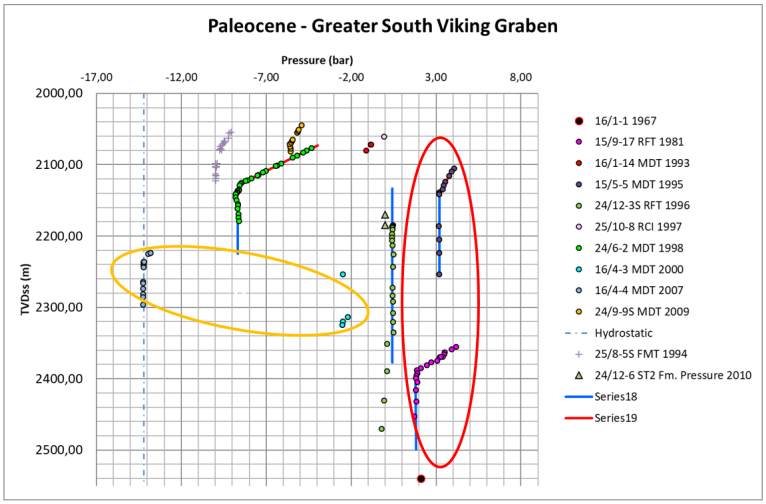


Figure 3.1 Regional pressure analysis

Geophysical Studies

Rock physics

Rock physics modelling has been performed to assess the expected geophysical response of Paleocene reservoirs. Not only the keys wells within PL913 and its immediate vicinity were analyzed, but also several key discovery (Alvheim, Bøyla, Glitne) wells were used for calibration of potential hydrocarbon phases. Generally it has been observed that brine saturated sands exhibit a strong positive peak which is dimming with offset, representing a class 1 AVO anomaly, whereas a hydrocarbon saturated sand is modelled to give a much weaker positve peak on near offsets and a phase reversal with increasing angle, representing a class 2P AVO anomaly. The discrimination between hydrocarbon phases is subtle, with gas sands showing slightly dimmer positive peak near traces and a slightly earlier phase reversal with increasing angle. Rock physics modelling of the 24/12-6 S well data, which is crucial for evaluation of the Satriani prospect, is shown as an example in Figure 3.2.

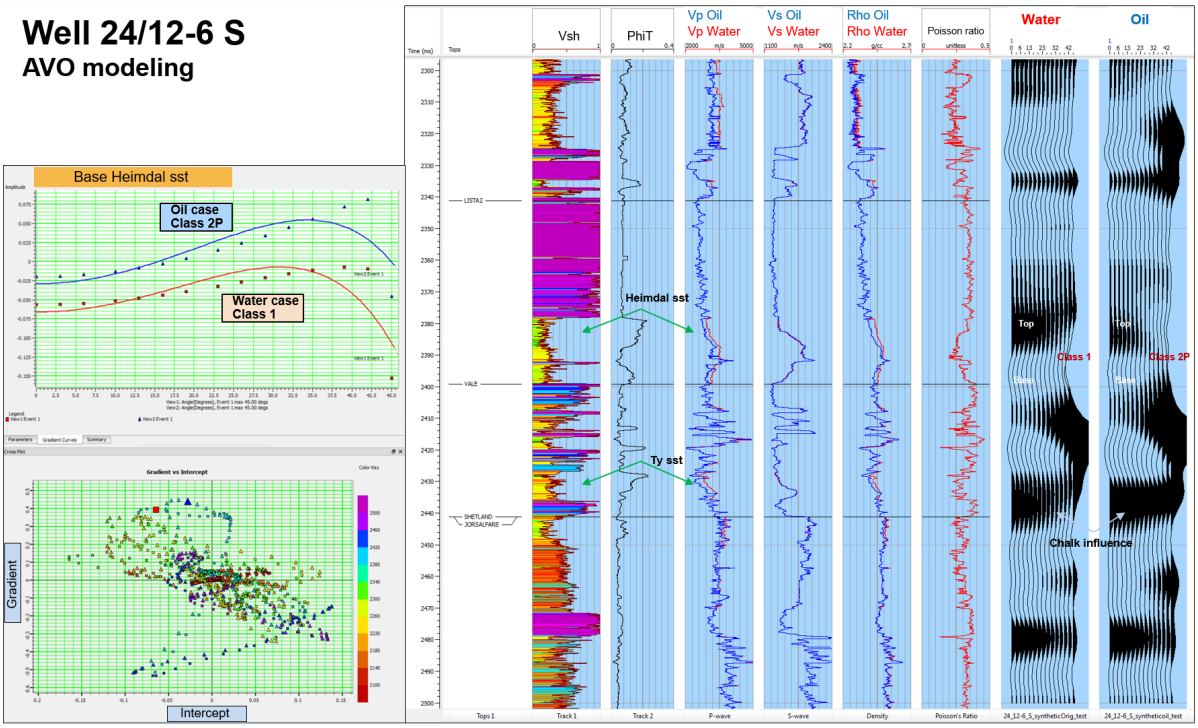


Figure 3.2 Well Modeling - 24/12-6 S (Satriani)

Modeling suggests that a water saturated reservoir should create a class 1 AVO response, compared to a class 2P response for hydrocarbon saturated sands.

Pre-stack data analysis

The implication of the observed AVO bahaviour is that hydrocarbon saturated sands are much less visible on full stack seismic data, compared to brine saturated sands. Therefore, the Satriani prospect requires pre-stack seismic data interpretation for effective evaluation. The software package Prestack Pro was used to pre-condition and analyze the gathers of the reprocessed seismic dataset OMV19M01 in order to de-risk the main prospect.

Seismic inversion feasibility

A seismic inversion feasibility study has been conducted, based on the results of the aforementioned rock physics work.The objective of this study was to investigate whether different fluid and lithology classes could be determined through inversion of the OMV19M01 seismic data. Special care was taken during processing of this dataset to ensure provision of reliable input to such analysis. It was found that the inversion results are compromised by the mostly weak reflectivity contrasts between sands and shales and by the fact that the majority of the stacked mass transport deposits are below or close to the tuning thickness (25m-30m). A relative acoustic impedance (RelAI) volume with moderate corellation to the well impedances is depicted in Figure 3.3.

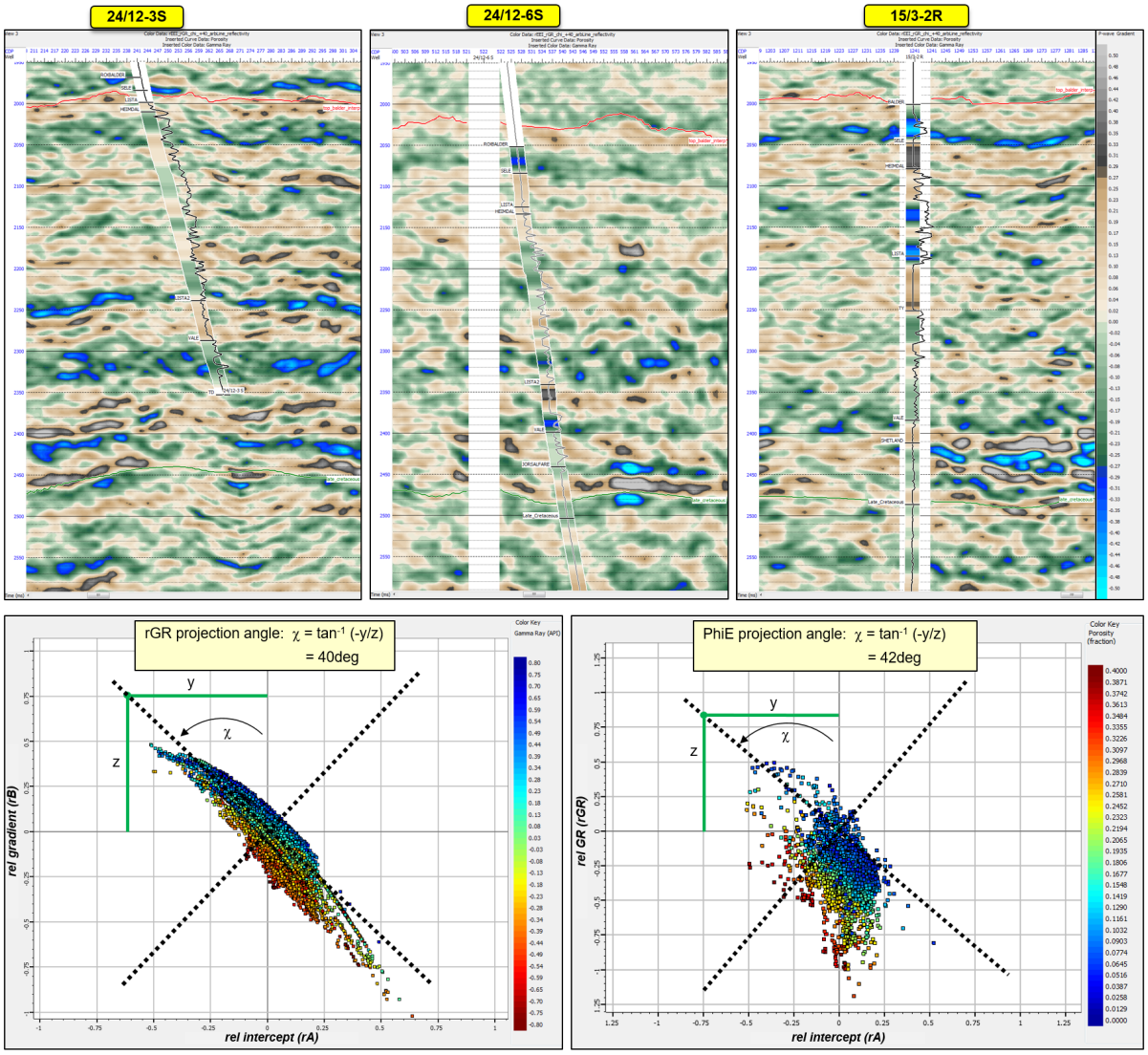


Figure 3.3 Acoustic Impedance Cube vs TWT 0-40 Stack

The resulting RelAI cube depicts the extent of hydrocarbon saturated sands.

4 PROSPECT UPDATE

Satriani Prospect

The Satriani prospect is the main prospect identified in the 2017 APA round (Figure 4.1). The prospect is located in the South Viking Graben, in-between the Vana and Vilje sub-basins, approximately 20 km north of the Gudrun field. The Satriani prospect is a four-way structural trap in the lower Paleocene Våle formation, comprised of Ty Member sandstones (Figure 4.2).The trap started forming in early Eocene (Ypresian) and is clearly defined on 3D seismic data. The reservoir consists of mass transport deposits sourced from the East Shetland Platform, sealed off by Lista formation shales. The key well for delineating the Satriani prospect is well 24/12-6 S, which found a water-up-to (WUT) at 2610m TVD and, thus, defines the maximum hydrocarbon column height and Pmax outline of the four-way closure. Potential hydrocarbon resources are distributed between the top of the Ty sandstone and the WUT defined in well 26/12-6 S, which penetrated the resevoir in a structural low, in the middle of the prospect outline. The Upper Jurassic Draupne and Heather formation shales are identified as the main source rocks.

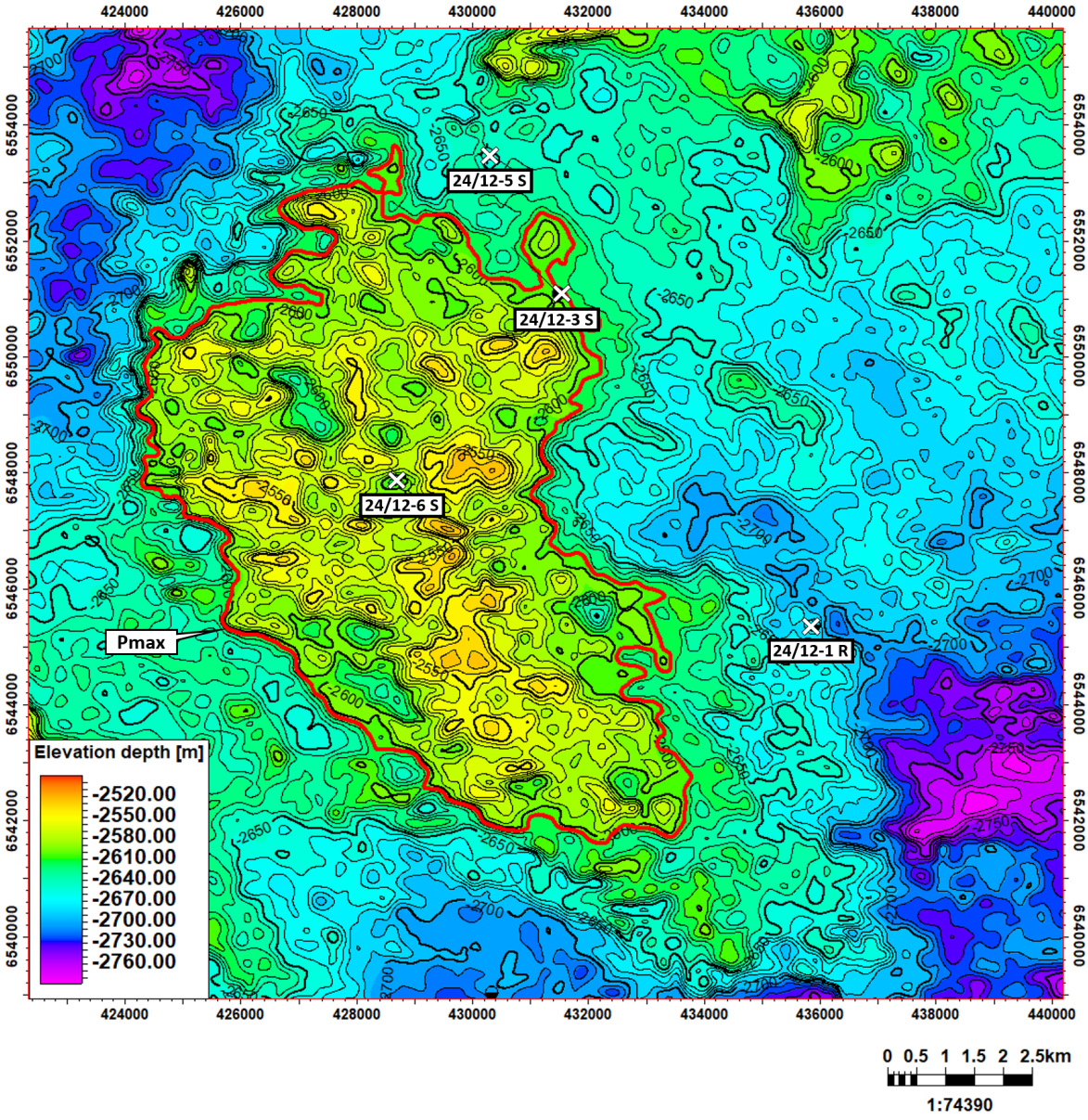


Figure 4.1 Top Satriani Reservoir Depth Structure Map

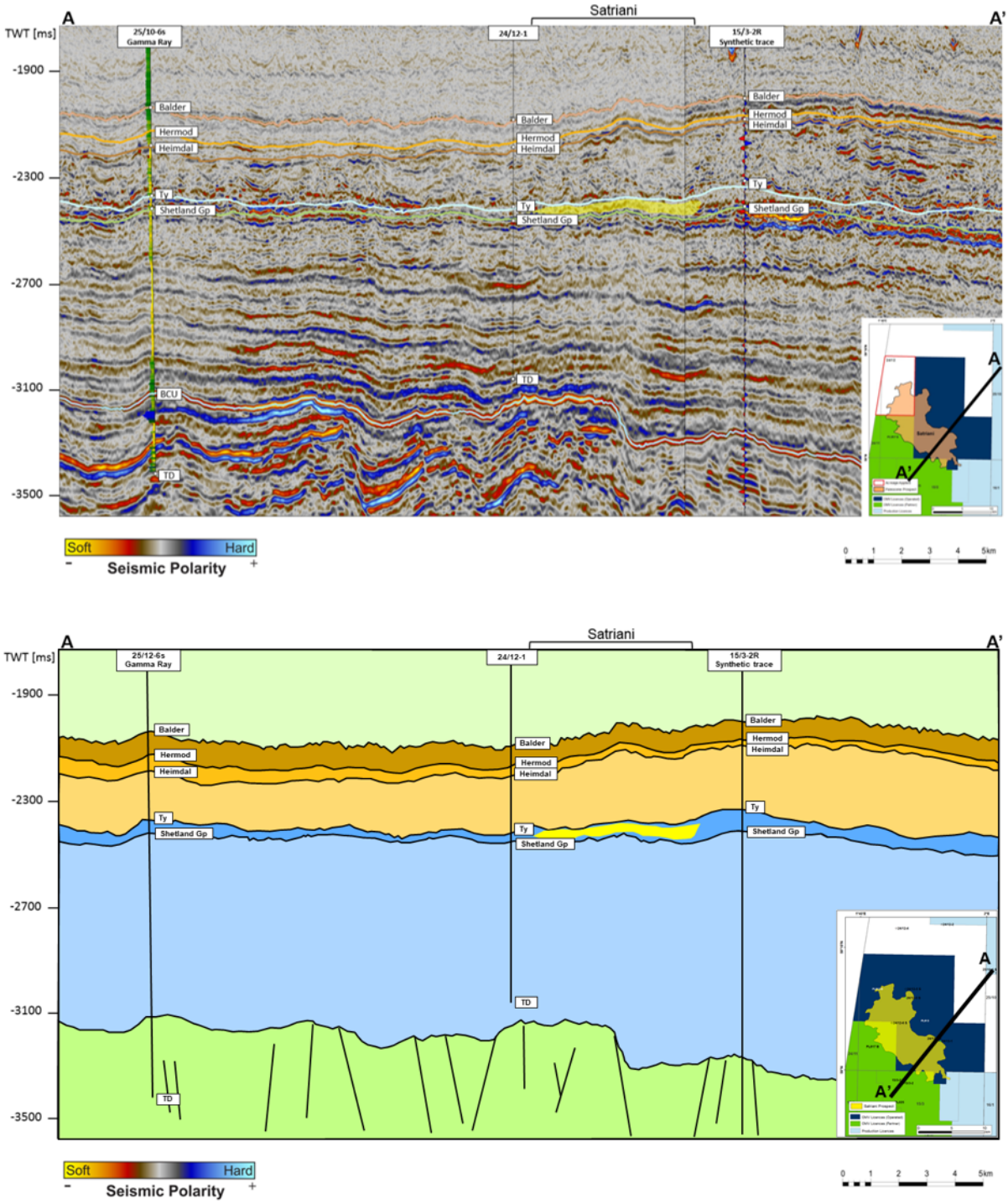


Figure 4.2 Seismic and Geosection through Satriani Prospect

By analysing the seismic gathers of the reprocessed data it is clear that the Satriani prospect does not exhibit the expected AVO response of a hydrocarbon saturated sand (Figure 4.3). Consequently, the reprocessed data could not confirm the amplitude anomaly initially interpreted on the pre-merge vintage data (MC3D-SVG11, MC3D-Q162013). Furthermore, the understanding of the regional pressure regime and the fact that all nearby wells were dry without shows in the lower part of the Paleocene system increase the likelihood of seal failure for Satriani, which is interpreted as the highest geologic risk.

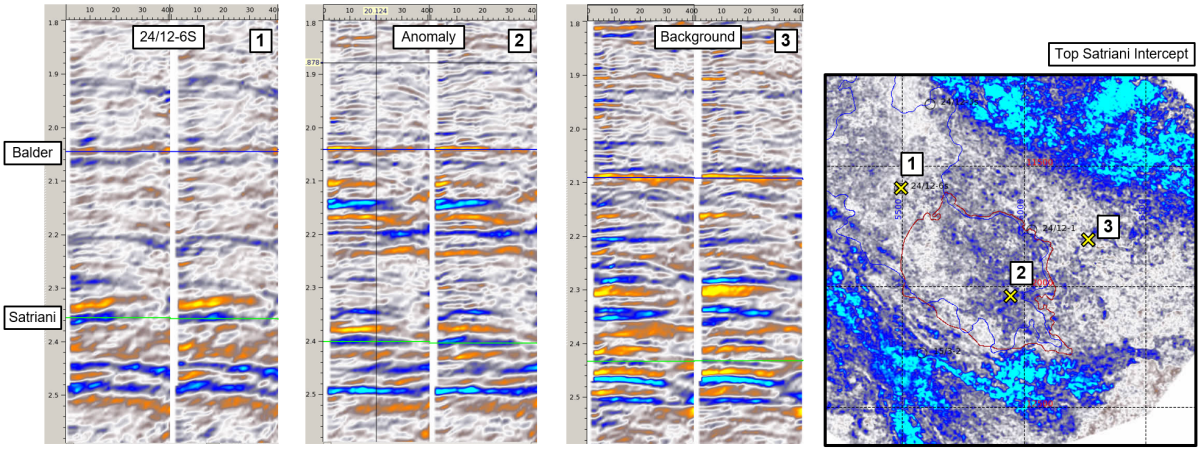


Figure 4.3 Selection of Gathers of Satriani Prospect and Background

The line depicts the similarity in AVO behaviour at top Satriani compared to background and dry well 24/12-6 S.

An overview of the volumes and risking for the Satriani prospect can be seen in Table 4.1.

Table 4.1 Satriani Prospect Data Sheet (NPD)

Block	24/12	Prospect name	Satriani	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)		Outside play (Y/N)					
Oil, Gas or O&G case:	Oil	Reported by company	OMV	Reference document	PL913/PL913 B Relinquishment Report			Assessment year	2019
This is case no.:	1 of 1	Structural element	Viking Graben	Type of trap	Structural	Water depth [m MSL] (>0)	115	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)	1,29	1,47	10,70	27,70				
	Gas [10^9 Sm^3] (>0.00)					0,10	0,10	0,88	2,19
Recoverable resources	Oil [10^6 Sm^3] (>0.00)	0,29	0,36	3,55	9,20				
	Gas [10^9 Sm^3] (>0.00)					0,03	0,04	0,31	0,77
Reservoir Chrono (from)	Paleocene	Reservoir litho (from)	Ty Formation	Source Rock, chrono primary	Volgian	Source Rock, litho primary	Draupne FM	Seal, Chrono	Selandian
Reservoir Chrono (to)	Paleocene	Reservoir litho (to)	Ekofisk Formation	Source Rock, chrono secondary	Kimmeridgian	Source Rock, litho secondary	Heather FM	Seal, Litho	Lista FM
Probability [fraction]									
Total (oil + gas + oil & gas case) (0.00-1.00)	1,00	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)	0,85	Trap (P2) (0.00-1.00)	0,80	Charge (P3) (0.00-1.00)	0,80	Retention (P4) (0.00-1.00)	0,20		
Parametres:	Low (P90)	Base	High (P10)	*Re-evaluation of Satriani volumes and risks following interpretation on new multiclient seismic reprocessing and completion and integration of all relevant G&G studies*					
Depth to top of prospect [m MSL] (> 0)		2520							
Area of closure [km^2] (> 0.0)	7,0	20,0	40,0						
Reservoir thickness [m] (> 0)	87	100	113						
HC column in prospect [m] (> 0)	28	47	70						
Gross rock vol. [10^9 m^3] (> 0.000)									
Net / Gross [fraction] (0.00-1.00)	0,20	0,32	0,47						
Porosity [fraction] (0.00-1.00)	0,16	0,19	0,22						
Permeability [mD] (> 0.0)	20,0	500,0	2000,0						
Water Saturation [fraction] (0.00-1.00)	0,46	0,32	0,19						
Bg [Rm3/Sm3] (< 1.0000)									
1/Bo [Sm3/Rm3] (< 1.00)	0,87	0,80	0,74						
GOR, free gas [Sm^3/Sm^3] (> 0)									
GOR, oil [Sm^3/Sm^3] (> 0)	54	81	114						
Recov. factor, oil main phase [fraction] (0.00-1.00)	0,15	0,30	0,45						
Recov. factor, gas ass. phase [fraction] (0.00-1.00)	0,20	0,35	0,50						
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)	85			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)	260			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. Vsh<=50	2. Porosity>=10	3.					Kart nr	NPD will insert value

Jurassic leads

In addition to the Paleocene main prospect three Upper Jurassic leads were mapped, named Søterot, Vendelrot and Rosenrot (Figure 4.4). Søterot and Rosenrot are located in the hanging wall of the 24/12-6 S fault and are comprised of turbidite sands of Volgian and Kimmeridgian age respectively. The partly stratigraphic traps depend on a lateral pinch-out towards well 24/12-6 S, which did not encounter any sands at this stratigraphic level.

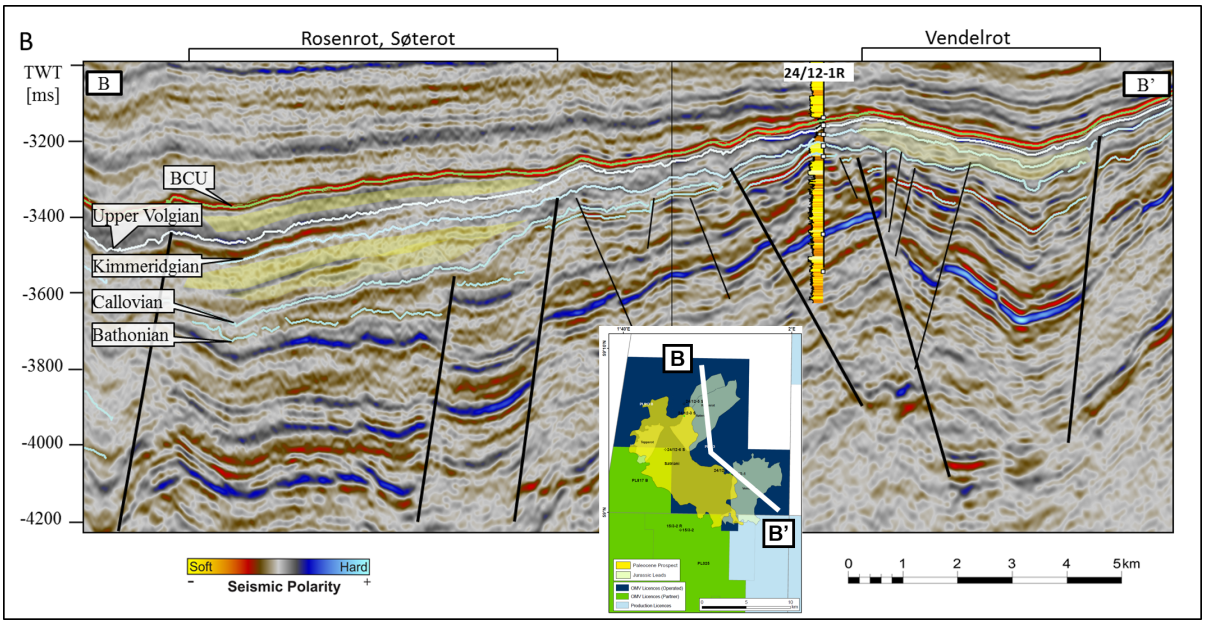


Figure 4.4 Seismic Section through Upper Jurassic Leads

Vendelrot, a Volgian-Kimmeridgian stratigraphic pinch-out trap, is defined by the thickness variations between BCU and top Callovian, and by seismic character. However, presence of the anticipated turbidite reservoir is considered as main risk together with seal integrity, as nearby well 15/3-2 R failed to find the respective sands.

Due to the high geologic risk, paired with moderate resource volumes, it was decided not to mature the described Jurassic leads to a prospect stage.

5 TECHNICAL EVALUATIONS

A technical evaluation and an economic analysis was performed for the Satriani prospect. A development scenario of a tie-back either to the existing Gudrun or Edvard Grieg production and export facilities was envisaged. The results of the economic analysis for the Satriani Prospect were marginally attractive and the decision was made to surrender the licenses PL913 & PL913 B.

6 CONCLUSIONS

The PL913 partnership has placed considerable effort in evaluating the prospectivity of the licenses. As a consequence of the work programme, the license stakeholders now have a much greater understanding of the prospectivity in the license.

The merging and reprocessing of seismic datasets into one large seismic volume has greatly improved the assessment of prospects and leads. Through the interpretation of this dataset, the geological risk and the expected resources of the Satriani prospect have changed dramatically.

All license commitments have been fulfilled. The main reasons for surrendering the license are listed below:

- Although the license contains multiple prospects and leads, the partnership struggles to make these prospects volumetrically attractive. Figure 6.1 depicts the prospectivity for the license, in addition to the location of the main Satriani prospect.
- Both licencees were unable to come to a positive drill decision due to marginal economics coupled with high risk.

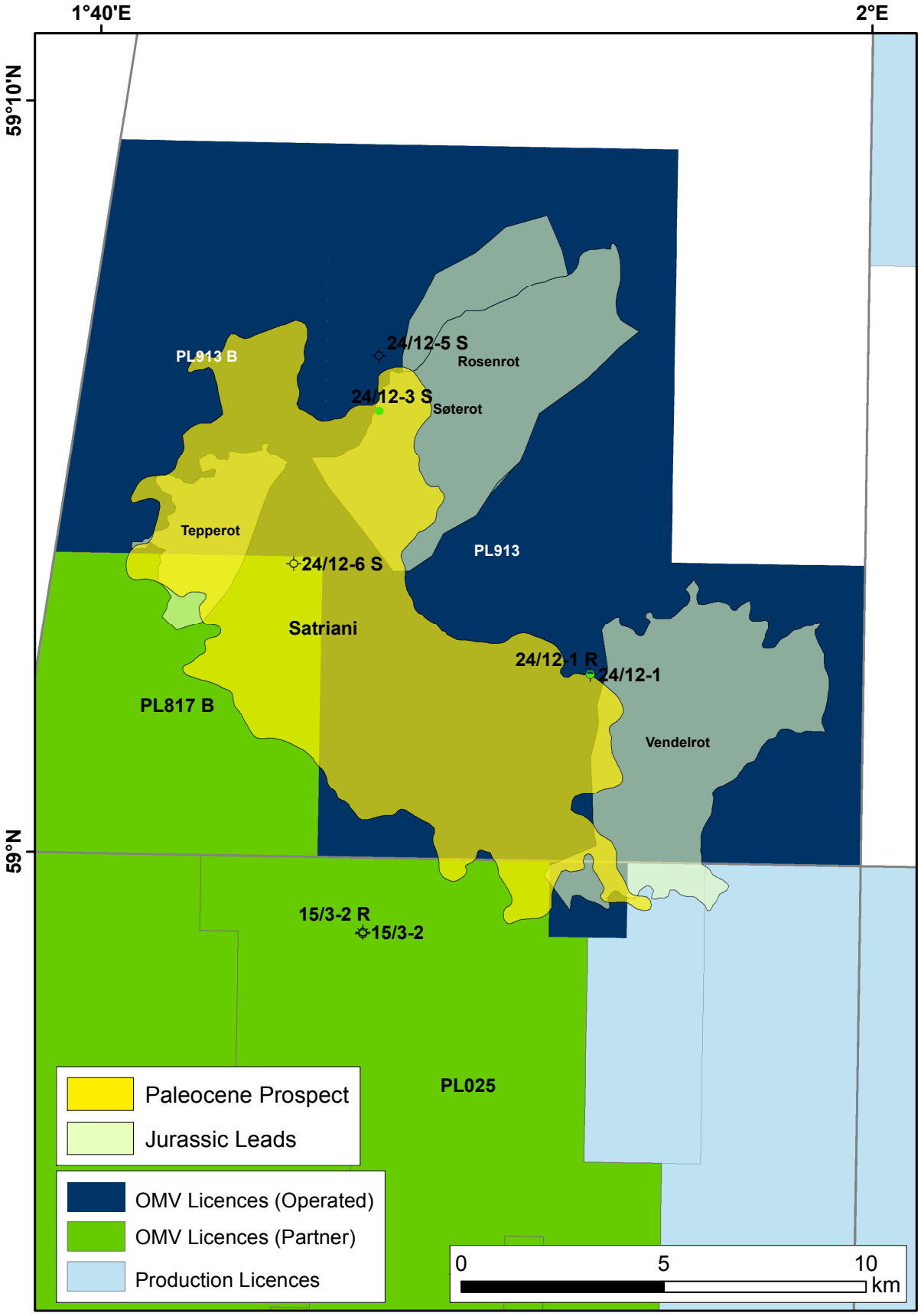


Figure 6.1 PL913/PL913 B Lead and Prospect Overview