Harbour Energy

Relinquishment report

PL 1114

vår energi

Sval

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Summary

Introduction
The PL 1114 licence is located in the Gimsan Basin in the hanging wall of the northeast-southwest oriented Bremstein Fault Complex. The licence is located in the southern portion of the Gimsan Basin and focuses on the Upper Jurassic prospectivity of a down-faulted block directly east of the Njord Field, and west of the Hyme and Bauge discoveries.

Serendipity is the main prospect, and it is defined as an Upper Jurassic sub-unconformity trap comprising the turbidite sandstone of the Intra-Melke Fm, encased within the Oxfordian shales of the Melke Fm. A Lead of analogous age, called Naish, was identified south of Serendipity on the eastern flank of the Njord structure. A further stratigraphic lead called Fortune has been identified within the Upper Jurassic section, and was interpreted as a sand-rich turbidite of the Rogn Fm and encased within the overlying Kimmeridgian – Volgian shales of the Spekk Fm. An overview map with prospect and leads outlines is shown in Fig. 1.

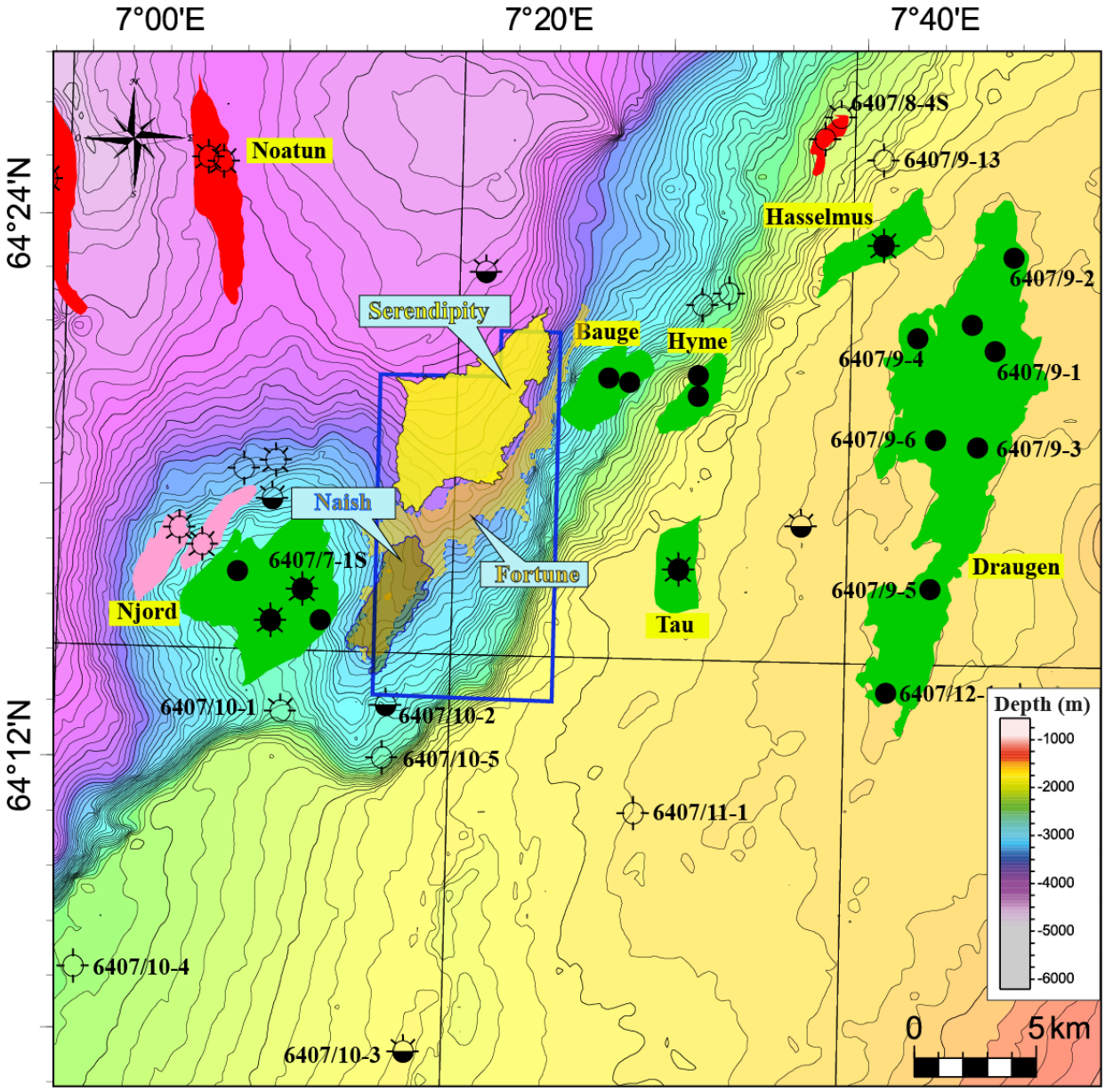

Fig. 1 Overview Map
BCU depth structure map illustrating the prospect, leads and licence outlines.

1 History of the production licence

General Information

- Date of award: 19.02.2021 (following APA 2020)
- Initial area: Parts of blocks 6407/7, 6407/8, 6407/10 and 6407/11. Total 99 km^2.
- Licensees at award: Harbour Energy Norge AS (Op.) 40%, Sval Energy AS (30%), Vår Energi ASA 30%.

The licence was awarded to a group consisting of Chrysaor Norge AS (Op.) 40%, Sval Energy AS 30% and Vår Energy Norge AS 30% in February 2021 (APA 2020).

Chrysaor Norge AS was renamed Harbour Energy Norge AS in 2022 without any changes to the Norway company structure. The following gives an overview of the key terms and conditions, as well as key events in the licence.

Work commitments, extensions and area relinquishment:

- Purchase and/or reprocess of 3D seismic and G&G Studies
- Drill or drop decision by 19.02.2023 extended to 19.11.2024
- BoK 19.02.2025 extended to 19.11.2026
- BoV 19.02.2027 extended to 19.11.2028
- PDO 19.02.2028 extended to 19.11.2029

The work obligations for Phase 1 have been fulfilled, comprising 3D seismic reprocessing and G&G work. The original drill or drop deadline was by 19th February 2023 but was subsequently extended by one year to 19th February 2024. The licence work during the first one-year extension was focused on seismic reprocessing and additional studies focused on reservoir quality and hydrocarbon migration. The licence applied for, and received, a second extension of 9 months to the drill or drop decision. The licence work during this phase was focused on performing rock physics analysis of the Ginny well (6407/9-13) and a seismic inversion feasibility study of the Melke Fm over the Serendipity prospect. Additional studies on pressure and hydrocarbon migration were also performed incorporating recently drilled wells in the area. The present drill or drop deadline is 19th November 2024.

Management and Exploration Committee Meetings:

- 16.03.2021 ECMC start-up meeting
- 21.10.2021 EC Workshop
- 28.10.2021 EC Work Meeting
- 24.11.2021 ECMC Meeting
- 19.01.2022 EC Workshop
- 23.06.2022 EC Workshop
- 21.09.2022 EC Work Meeting
- 27.10.2022 EC Workshop
- 07.12.2022 ECMC Meeting
- 28.02.2023 EC Workshop
- 13.04.2023 EC Work Meeting
- 22.06.2023 EC Workshop
- 07.09.2023 ECMC Meeting
- 28.11.2023 ECMC Meeting
- 13.06.2024 ECMC Meeting
- 31.10.2024 ECMC Meeting

Reasons for drop

The Upper Jurassic prospectivity identified for the licensing round application was described as two sand-prone sequences separated by a shale unit in the Upper Jurassic Viking Gp. The Serendipity α prospect (primary prospect) was mapped in the lower of the two sandstone units, and the Serendipity β prospect in the uppermost. Both were considered stratigraphic traps in submarine fan sandstones of the Rogn Fm. The interpretation of the reprocessed data, updated biostratigraphy and revised well tie have shown that the Serendipity α prospect is a sand prone sequence within the Oxfordian Intra-Melke Fm sandstones. A further prospect of analogous age was identified by the partners and called Naish. In order to avoid confusion and to better rank the prospectivity of the area the licence group decided to rename the prospect and leads as follows:

- Serendipity (former Serendipity α), main prospect in the Oxfordian Intra-Melke Fm sandstone
- Naish, lead in the Oxfordian Intra-Melke Fm sandstone
- Fortune, (former Serendipity β), lead in Kimmeridgian Rogn Fm sandstone.

The Serendipity prospect, which was identified in the original licence application as the main target, has been re-evaluated using reprocessed data (CRAM internal Harbour processing). Seismic reprocessing enhanced the seismic quality and provided more accurate mapping of both top and base reservoir with the corresponding risk reduced. The interpretation of the reprocessed seismic survey combined with both the updated biostratigraphy on a number of nearby wells and the structural interpretation led to a revised depositional model that places the Serendipity prospect as a sand-prone deep marine fan in the Oxfordian Intra-Melke Fm. The reservoir studies and the structural analyses carried out by the operator have shown that the erosion of the Frøya High and the footwall of the Bremstein Fault complex could have generated a significant amount of coarse clastic sediment in the Oxfordian deep marine environment and created sand-prone sequences such as Serendipity.

Although reservoir is not considered the main risk by the operator, the partners believe that the reservoir is a key uncertainty and the wide variety of studies carried out by the Operator have not been able to conclude with a high degree of certainty regarding the presence and quality of the reservoir in Serendipity.

The critical risk for the Serendipity prospect is seal. All special studies carried out during the licence period could not categorically exclude the presence of thief sands in the overlaying Upper Jurassic shales. The possible presence of thief sands was a key criterion for the column height definition, resulting in the volumes being reduced. The seismic inversion feasibility study did not provide any uplift regarding the reservoir risk.

Upon completion of the work program the licence group came to the conclusion that the prospect did not defend continuation of the licence due to the risks related to seal and reservoir and the reduced prospective potential.

2 Database overview

2.1 Seismic data

The common seismic database consists of the PGS multiclient 3D survey PGS 14005. A data gap in the PGS survey over the Njord and Draugen fields was in-filled with the 3D survey DN 0902 and NH9701 (Table 2.1). The broadband GeoStreamer survey was acquired and processed in 2014. The PGS 14005 seismic survey covers the full application area as well as large areas outside it. The data includes a full suite of offset data consisting of six final and raw angle stack volumes, full stack volumes and velocity data.

Table 2.1 Seismic database

Survey name	Licence name	Type of licence	NPDID for survey
PGS14005	488	Undersøkelsestillatelse	8054
DN0902	335	Undersøkelsestillatelse	7044
NH9701		Undersøkelsestillatelse	3859

As a part of the work programme the licence performed a reprocessing project with PetroTrace covering the key prospectivity, offset wells and fields adjacent to the licence. In order to achieve better seismic imaging and geological understanding of the licence area the PL 1114 partners agreed to reprocess over a large area that also covered parts of PL 1113 to the east. The proprietary reprocessed dataset with the official name CHR21M01 covers an area of 460 km^2 with fully migrated data (Fig. 2.1). In addition, Harbour performed an Estimate Q from a drift trends study and an in-house seismic Common Reflection Angle Migration (CRAM) imaging reprocessing. Kirchhoff and Q-CRAM seismic volumes were used as final imaging products.

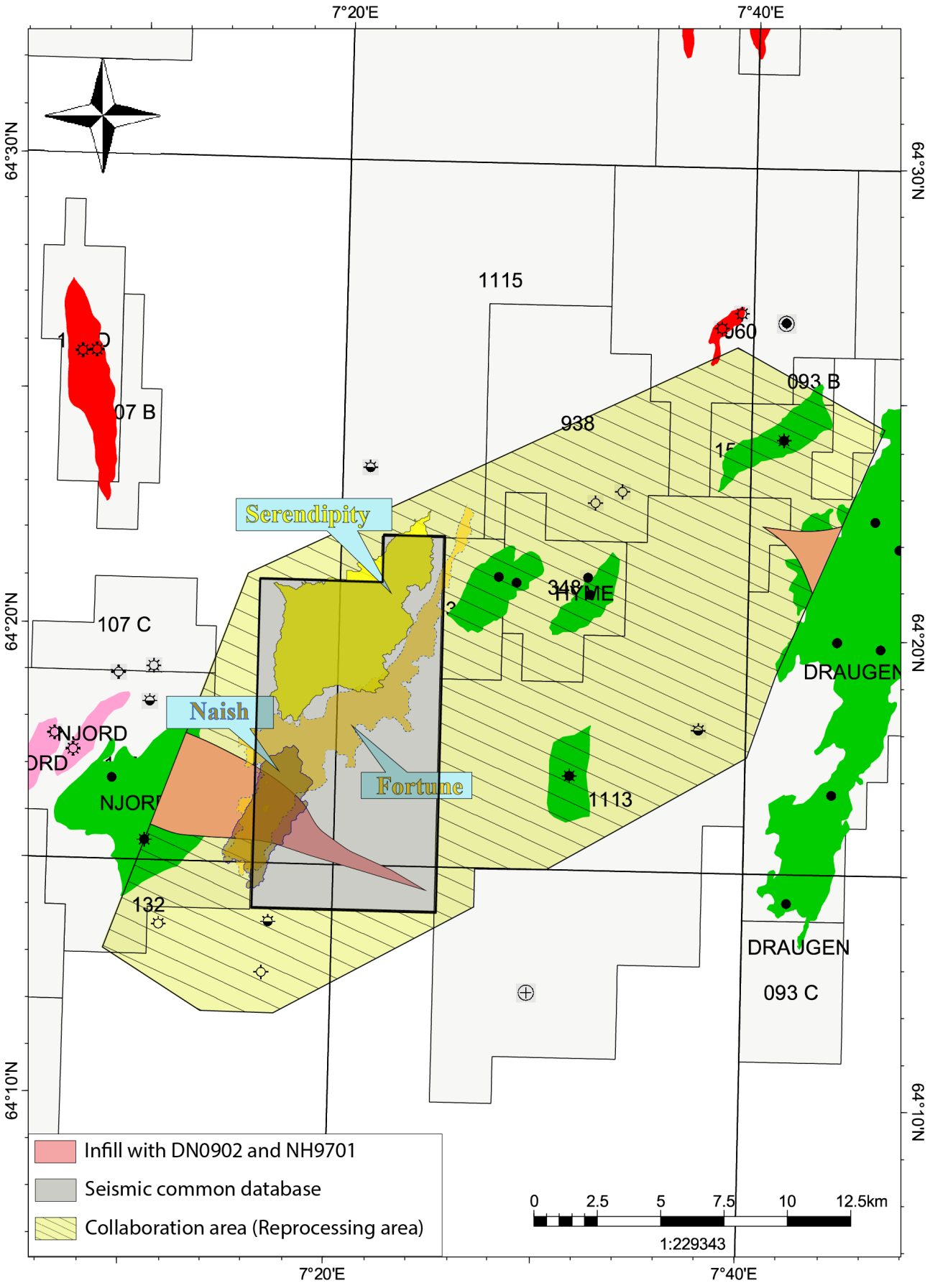

Fig. 2.1 Seismic Database

2.2 Well data

The wells used for the prospect evaluation in PL 1114 are shown in Table 2.2

Table 2.2 PL 1114 well database

Well Name	Name of Discovery/	Year completed	Company	Results	NPDID	TD (TVD) (m RKB)/
6406/12-1S		1991	Den Norske Stats	Dry	1711	3891/ Melke Fm
6406/12-2		1995	Den Norske Stats	Dry	2640	4363/ Melke Fm
6406/12-3 A	Bue/ Fenja	2014	VNG Norge	Oil	7432	3657/ Melke Fm
6406/12-4 A		2015	VNG Norge	Dry	7774	3824.5/ Melke Fm
6406/12-4 S	Boomerang	2015	VNG Norge	Oil	7721	3882.9/ Intra Melke
6406/12-5 S		2015	VNG Norge	Dry	7787	3734/ Melke Fm
6407/5-2 S	Cortina	2011	OMV Norge	Gas	6648	3390/ Garn Fm
6407/6-7 S	Harepus	2009	Statoil Hydro	Gas	6100	3184/ Åre Fm
6407/7-1	Njord	1986	Norsk Hydro	Oil/Gas	474	3925/ Red Beds
6407/8-4 S	Galtvort	2008	Statoil Hydro	Gas	5813	2650/ Åre Fm
6407/9-1	Draugen	1984	Norske Shell	Oil	133	2500/ Red Beds
6407/9-2	Draugen	1985	Norske Shell	Oil	449	1865/ Tilje Fm
6407/9-3	Draugen	1985	Norske Shell	Oil	469	1868/ Tilje Fm
6407/9-4	Draugen	1985	Norske Shell	Oil	480	1820/ Tilje Fm
6407/9-5	Draugen	1985	Norske Shell	Oil	492	1819/ Not Fm
6407/9-6	Draugen	1986	Norske Shell	Oil	871	1796/ Ror Fm
6407/9-10	Draugen	2003	Norske Shell	Oil	4710	1800/ Not Fm
6407/9-13	Ginny	2022	Equinor	Dry	9446	2319/ Ror Fm
6407/10-1		1987	Norsk Hydro	Shows	1054	3346/ Grey Beds
6407/10-2		1990	Norsk Hydro	Shows	1497	3824/ Tilje Fm
6407/10-5	Portrush	2015	Norske Shell	Dry	7763	2889/ Intra Melke
6407/12-1	Draugen	1999	Norske Shell	Oil	3781	1803/ Garn Fm
6407/12-3	Careus	2010	Centrica Resources	Dry	6370	1968/ Ile Fm

3 Results of geological and geophysical studies

Several internal and external G&G studies have been undertaken as part of the licence work program to evaluate the prospectivity of the PL 1114 licence area.

Seismic reprocessing
As a part of the work programme, the PL 1114 licence group agreed to reprocess a large area of the PGS multiclient 3D survey PGS 14005. To increase the resolution and continuity of reflectors, several CRAM re-processing cubes of the PGS data have been generated internally by Harbour Energy, providing better seismic imaging and geological understanding of the licence area. CRAM offers several advantages over standard Kirchhoff migrations as well as other accurate techniques e.g., wavefront reconstruction and beam migration. The CRAM algorithm does not require regularized data at the surface. It tracks rays from gridded subsurface points to any given surface coordinate, coupling all possible source-receiver pairs. In this project Q compensation was applied within the migration algorithm to accurately measured ray-paths. The CRAM datasets resulted in higher continuity of the seismic data and was chosen as the main datasets for interpretation. The final seismic interpretations were completed on the CHR21M02_3D_Fin_CRAM_Full_Time.

Depth conversion
Harbour Energy has purchased and utilised ESTIMAGE's regional Norwegian Sea velocity model for depth conversion. The velocity cube has been upgraded with proprietary regional surveys and the calibration of the seismic velocities to the wells has been guided by regional interpretation grids using a 3D-kriging with external drift algorithm. The resolution of the model is 1 x 1 km x 40 ms TWT. In parallel, Harbour energy built a velocity model for depth conversion using the CRAM seismic velocities and key wells, which offer better results.

Seismic interpretation and mapping
Seismic interpretations have been performed on several seismic cubes utilising a variety of volume attributes. To increase the resolution and continuity of reflectors, several CRAM re-processing cubes of the PGS data have been generated internally in Harbour Energy.

Reservoir studies
To help identify and to accurately determine the age of the Upper Jurassic sandstone intervals the licence group procured two studies from PetroStrat. The first study was a multi-client project focussed on the biostratigraphy and reservoir geology of the Rogn Formation (PetroStrat, 2017). The second was a proprietary study with additional focus on the Intra-Melke sandstones. Both studies were assimilated and integrated with the seismic interpretation and the semi-regional structural model to ascertain hinterland/provenance signatures and to help understand sediment transport pathways.

Basin modelling
The occurrence of several hydrocarbon accumulations in a variety of stratigraphic intervals demonstrates the presence of an effective petroleum system in the area. An integrated source rock, maturation and charge migration model was developed for the area by APT. This model was later improved by an in-house Trinity Basin Model conducted in Q1 2023 to improve the understanding on how hydrocarbon maturation and expulsion has affected trap filling models from the Gimsan Basin to the footwall of the Bremstein Fault Complex. The basin model was carried out to assess regional Upper Jurassic Melke source rock maturity and hydrocarbon migration into the Upper Jurassic Intra- Melke Fm reservoir. Prospect and leads were modelled as oil cases, and since Serendipity is embedded in the Melke FM source rock the charge and migration risks are considered to be low for the prospects.

Geochemical Studies
To help with the basin modelling, migration modelling and with the identification of intra-formation seals, three multi-client studies were purchased from GeoProvider (GeoProvider, 2021, Rep No's. 204, 686, and 687). The results of these studies were incorporated in the semi-regional basin analysis and pressure model.

4 Prospect update report

4.1 Serendipity Prospect

Regional geological setting

Top structure, and thickness maps for the Serendipity prospect and leads are exhibited in Fig. 4.1. Serendipity and Naish are interpreted as sand-prone sequences encased within the overlying Oxfordian shales of the Melke Fm (Fig. 4.2). Fortune is interpreted as a sand-rich turbidite of the Rogn Fm and encased within the overlying Kimmeridgian – Volgian shales of the Spekk Fm. These sand prone sequences were deposited within submarine fans in a lower slope to basin floor position, and fed by slope channels receiving eroded Triassic and Lower to Middle Jurassic material from the nearby Bremstein Fault Complex footwall.

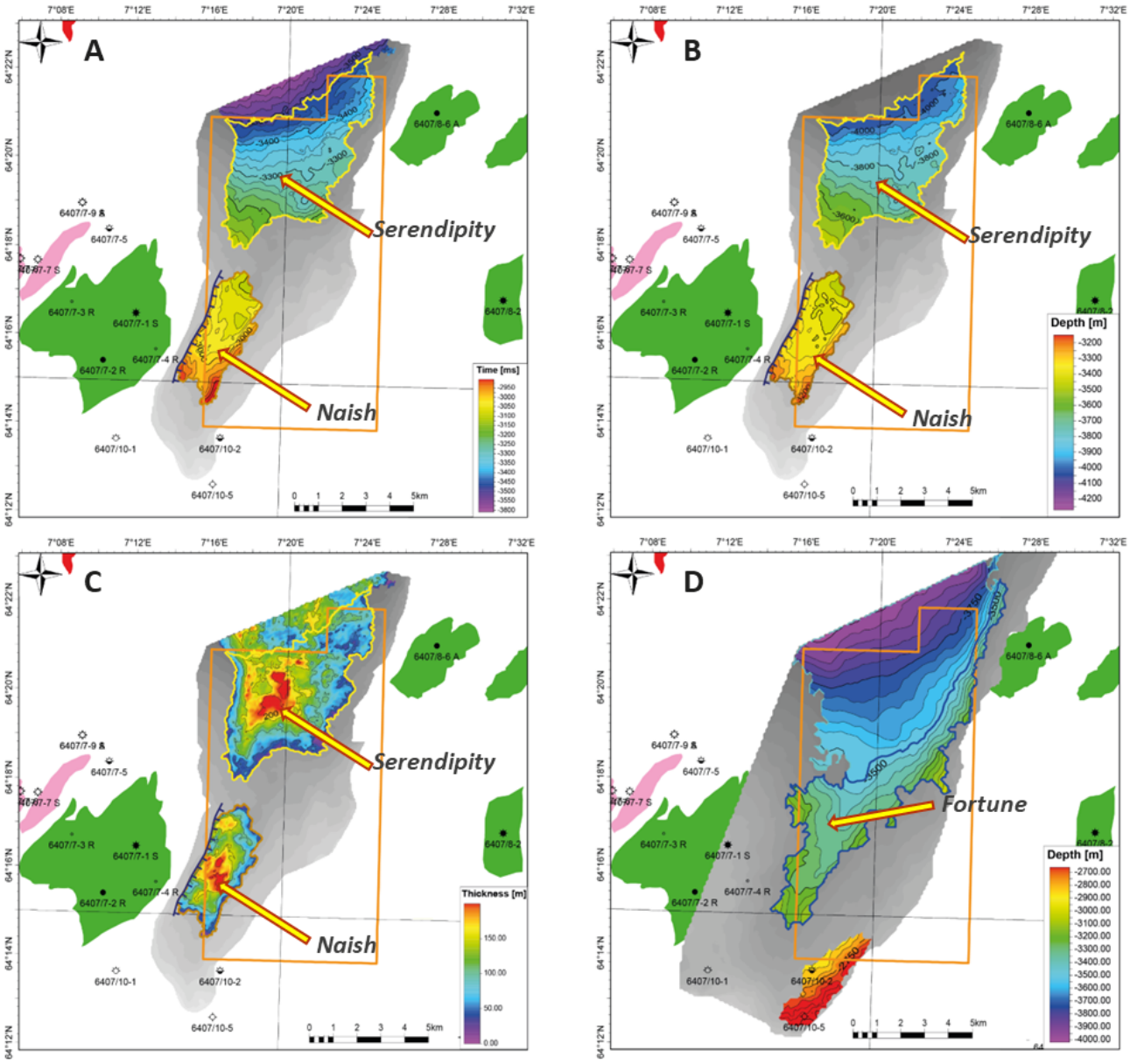

Fig. 4.1 Top Structure and Thickness Maps.

A. TWT map illustrating the Serendipity prospect and Naish lead. B. Depth map illustrating the Serendipity prospect and Naish lead. C Reservoir thickness map for the Serendipty prospect and Naish lead. D. Depth map exhibiting the Fortune lead.

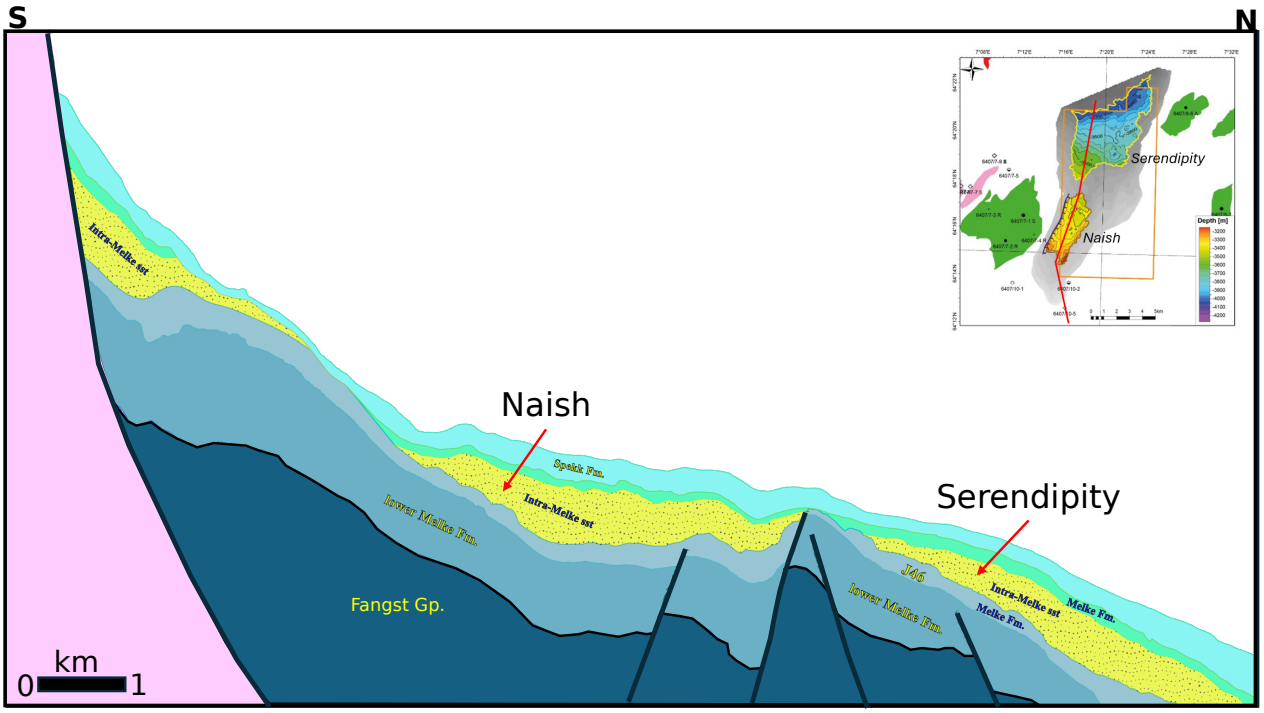

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Fig. 4.2 Serendipty and Naish GeoSection

The deposition of the Serendipity deep-marine sands was controlled by the topography of the Gimsan Basin. Fold nucleation and amplification processes related to the Callovian – Oxfordian reactivation of the Bremstein Fault complex, generated topographic relief that acted as bypass zones and controlled the distribution of the deep-marine deposits. Intra-Melke Fm reservoir sandstones have been encountered in the nearby 6407/10-5 well. Thin sands strings within the Oxfordian Melke Fm were also observed in the 6407/8-1 well. The Intra-Melke sandstone encountered in the 6407/10-5 well is believed to be sourced from the Frøya High, whereas the Intra-Melke sandstone in the Serendipity prospect is sourced from the East. The Lower and Middle Jurassic deposits on the Bremstein Fault Complex footwall were exposed and eroded during the Oxfordian and transported westwards into the Gimsan Basin.

Serendipity is an Upper Jurassic sub-unconformity trap comprising the turbidite sandstone of the Intra-Melke Fm and encased in the Oxfordian shales of the Melke Fm (Fig. 4.2). The trap geometry is well-defined from seismic mapping by a southeast and west pinch-out of the Intra-Melke Fm sandstones on the Melke Fm shales and a dip closure to the north. The structure is well imaged on the second derivative seismic volume.

The main G&G risk for the Serendipity prospect is seal, set to 0.65. The main risk elements are discussed below.

During Oxfordian and Kimmeridgian time, sand prone sequences were deposited within submarine fans in a lower slope to basin floor position, and fed by slope channels receiving eroded Triassic and Lower to Middle Jurassic material from the nearby Bremstein Fault Complex footwall.

Discovery probability and main risks elements

The NPD standards for discovery probability were used to assess the discovery probability of the prospect and leads within the PL 1114 licence. It consists of four individual petroleum system risk elements for prospect (reservoir, trap, charge and retention) and three risk elements for the associated play (reservoir, trap and source). No play risk is associated for reservoir and trap with the Upper Jurassic, Intra-Melke play at this location. The play concept for hydrocarbons trapped in the Upper Jurassic reservoirs is proven in numerous analogues on the NCS. A risk of 0.8 was applied to the Source. Geochemical analyses of the Oxfordian section of the

Melke Fm show high values of TOC and HI, defining this portion of the Melke shale as an oil prone source rock. However, the scarcity of well data penetrating the whole Melke Fm section and specifically the upper portion, led to an increase in the play risk for source.

Trap. Serendipity is a complex Upper Jurassic sub-unconformity trap at the Upper Jurassic Intra - Melke Fm level. It was mapped with good confidence on several seismic surveys. The trap geometry is also well-defined and pinch out of the Intra-Melke sandstone could be mapped with a high degree of confidence. Hence, the trap risk has been set to 0.85.

Reservoir. Seismic data and seismic modelling provide support for the presence of Upper Jurassic sandstones in the area. In addition, the palaeogeographic understanding and the results of the neighbouring wells also suggest the presence of a producible reservoir. Moderate to good quality Upper Jurassic reservoir is proven nearby in wells 6407/10-2 and 6407/10-5. Although sandy sequences are interpreted in the Serendipity prospect, the presence of shale in the interpreted reservoir section cannot be ruled out. Therefore, Serendipity reservoir presence and effectiveness was set to 0.7.

Seal. The trap geometry is well-defined, but trap seal is regarded as the main uncertainty for the Serendipity prospect. Top and base seal are provided by the Upper Jurassic mudstones of the Melke Fm which represent a competent seal. However, the presence of thief sands within the Melke Fm can not be excluded and is below seismic resolution. Hence, the trap risk has been set to 0.65.

Charge and migration. The Intra-Melke reservoir sandstone of the Serendipity prospect are embedded in the Oxfordian section of the Melke Fm, believed to be a precursor of the Spekk Fm. The Oxfordian section of the Melke Fm shales were deposited in poorly oxygenated to anoxic basin condition. A detailed geochemical review of all available data and analogues (Fenja) showed that the Oxfordian section of the Melke Fm is more oil prone whilst the Callovian section is gas prone and has lower TOC and HI values. Furthermore, Harbour in-house basin modelling indicates that there is enough HC generated in the fetch area to fill the Serendipity prospect. Considering the direct juxtaposition of the reservoir with the source rock the risk for charge and migration was set to 1. However, due to the risk associated with the play (0.8) the overall risk for migration and charge is 0.8.

The overall chance of success for the Serendipity prospect is estimated to 31%.

4.2 Remaining prospectivity

Naish is a combined stratigraphic and structural trap within the Oxfordian Intra-Melke Fm (Fig. 4.2). The trap geometry is defined by the onlap and truncation of the Melke sandstone on the main Intra-Melke unconformity and the Base Spekk Unconformity to the east, north and south. A normal fault bounds the prospect to the west and juxtapose the Oxfordian sandstones with the shale and mudstone of Not Fm and the lower Melke shales. Top and base seal consist of the Melke Fm shales, a proven seal for major fields and within the study area. The lateral seal is controlled by the east dipping fault which bounds the prospect to the west. Naish is embedded in early mature source rocks and charge requires a migration route from north-north west. The presence of an early mature source rock and the complexity of the migration mechanism make migration the main risk.

The overall chance of success for the Naish Lead is estimated to 22%.

Fortune is a stratigraphic pinch-out trap within the Kimmeridgian - Volgian Rogn Fm (Fig. 4.1). The trap geometry is defined by the onlap of the Rogn Fm on the shale of Spekk Fm to the east and west. The pinch out can be easily mapped in the central part, but it becomes subtle and hard to follow towards the east in the proximity of the Bremstein FC. Despite using II Derivative volume the level of confidence for the trap geometry varies from high to medium-low. Rogn Fm sandstone was encountered in the Gimsan Basin and in the adjacent platform to the east where they represent the main reservoir of the Draugen Field. Top and base seal consist

of the Spekk Fm shales. Despite the fact that the presence of the Rogn Fm sandstone is well documented in the area, the quality of the reservoir represent the main risk. Moreover, the lack of seismic resolution towards the Bremstein fault complex makes trap a key risk for the Fortune lead.

The overall chance of success for the Fortune Lead is estimated to 19%.

4.3 Resource evaluation

Harbour Energy uses the GeoX (Schlumberger) probabilistic tool to assess potential resource volumes in the prospects and leads. In order to capture uncertainty, a distribution range for each static and dynamic parameter is determined, resulting in resource potential distributions. The input parameters and volume calculation for the PL 1114 prospectivity is summarised in Table 4.1, Table 4.2 and Table 4.3 .

Table 4.1 Serendipity prospect resources table

Table 4: Discovery and Prospect data (Enclose map)

Block	6407/7, 8, 10 and 11	Prospect name	Serendipity	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	Harbour Energy	Reference document	PL1114 status report for surrender of production license			Assessment year	2023
This is case no.:	1 of 1	Structural element	Gimsan Basin	Type of trap	Stratigraphic	Water depth [m MSL] (>0)	320	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)	7.39	10.80	18.70	31.30				
	Gas [10^9 Sm^3] (>0.00)					1.27	2.40	3.34	5.82
Recoverable resources	Oil [10^6 Sm^3] (>0.00)	2.65	4.62	8.90	15.80				
	Gas [10^9 Sm^3] (>0.00)					0.47	0.86	1.59	3.02
Reservoir Chrono (from)	Upper Jurassic	Reservoir litho (from)	Intra-Melke Fm.	Source Rock, chrono primary	Upper Jurassic	Source Rock, litho primary	Melke Fm	Seal, Chrono	Upper Jurassic
Reservoir Chrono (to)	Upper Jurassic	Reservoir litho (to)	Intra-Melke Fm.	Source Rock, chrono secondary		Source Rock, litho secondary		Seal, Litho	Melke Fm
Probability [fraction]									
Total (oil + gas + oil & gas case) (0.00-1.00)	0.31	Oil case (0.00-1.00)	0.31	Gas case (0.00-1.00)	0.00	Oil & Gas case (0.00-1.00)	0.00		
Reservoir (P1) (0.00-1.00)	0.70	Trap (P2) (0.00-1.00)	0.85	Charge (P3) (0.00-1.00)	0.80	Retention (P4) (0.00-1.00)	0.65		

Parametres:	Low (P90)	Base	High (P10)	*Comments*
Depth to top of prospect [m MSL] (> 0)		3440		
Area of closure [km^2] (> 0.0)				
Reservoir thickness [m] (> 0)				
HC column in prospect [m] (> 0)	225	262	340	
Gross rock vol. [10^9 m^3] (> 0.000)	2.099	2.342	2.577	
Net / Gross [fraction] (0.00-1.00)	0.58	0.74	0.88	
Porosity [fraction] (0.00-1.00)	0.12	0.14	0.19	
Permeability [mD] (> 0.0)				
Water Saturation [fraction] (0.00-1.00)	0.21	0.32	0.44	
Bg [Rm3/Sm3] (< 1.0000)				
1/Bo [Sm3/Rm3] (< 1.00)	0.57	0.66	0.73	
GOR, free gas [Sm^3/Sm^3] (> 0)				
GOR, oil [Sm^3/Sm^3] (> 0)	144	178	229	
Recov. factor, oil main phase [fraction] (0.00-1.00)	0.33	0.44	0.52	
Recov. factor, gas ass. phase [fraction] (0.00-1.00)	0.33	0.44	0.52	
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)	133			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)	75			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

Table 4: Discovery and Prospect data (Enclose map)

Block	6407/7, 8, 10 and 11	Prospect name	Naish	Discovery/Prosp/Lead	Lead	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	Harbour Energy	Reference document	PL1114 status report for surrender of production license			Assessment year	2023
This is case no.:	1 of 1	Structural element	Gimsan Basin	Type of trap	Strat-struct	Water depth [m MSL] (>0)	320	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)	2.13	2.42	12.00	28.00				
	Gas [10^9 Sm^3] (>0.00)					0.40	0.60	2.15	5.10
Recoverable resources	Oil [10^6 Sm^3] (>0.00)	0.90	0.85	5.23	5.10				
	Gas [10^9 Sm^3] (>0.00)					0.15	0.21	0.93	2.25
Reservoir Chrono (from)	Upper Jurassic	Reservoir litho (from)	Intra-Melke Fm.	Source Rock, chrono primary	Upper Jurassic	Source Rock, litho primary	Melke Fm	Seal, Chrono	Upper Jurassic
Reservoir Chrono (to)	Upper Jurassic	Reservoir litho (to)	Intra-Melke Fm.	Source Rock, chrono secondary		Source Rock, litho secondary		Seal, Litho	Melke Fm
Probability [fraction]									
Total (oil + gas + oil & gas case) (0.00-1.00)	0.22	Oil case (0.00-1.00)	0.22	Gas case (0.00-1.00)	0.00	Oil & Gas case (0.00-1.00)	0.00		
Reservoir (P1) (0.00-1.00)	0.65	Trap (P2) (0.00-1.00)	0.80	Charge (P3) (0.00-1.00)	0.60	Retention (P4) (0.00-1.00)	0.70		

Parametres:	Low (P90)	Base	High (P10)	*Comments*
Depth to top of prospect [m MSL] (> 0)		3100		
Area of closure [km^2] (> 0.0)				
Reservoir thickness [m] (> 0)				
HC column in prospect [m] (> 0)	184	250	345	
Gross rock vol. [10^9 m^3] (> 0.000)	0.790	0.870	0.960	
Net / Gross [fraction] (0.00-1.00)	0.58	0.73	0.88	
Porosity [fraction] (0.00-1.00)	0.11	0.14	0.19	
Permeability [mD] (> 0.0)	0.1			
Water Saturation [fraction] (0.00-1.00)	0.21	0.32	0.4400	
Bg [Rm3/Sm3] (< 1.0000)				
1/Bo [Sm3/Rm3] (< 1.00)	0.57	0.66	0.73	
GOR, free gas [Sm^3/Sm^3] (> 0)				
GOR, oil [Sm^3/Sm^3] (> 0)	144	178	229	
Recov. factor, oil main phase [fraction] (0.00-1.00)	0.33	0.44	0.52	
Recov. factor, gas ass. phase [fraction] (0.00-1.00)	0.33	0.44	0.52	
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)				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)				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

Table 4.2 Naish lead resources table

Table 4: Discovery and Prospect data (Enclose map)

Block	6407/7, 8, 10 and 11	Prospect name	Fortune	Discovery/Prosp/Lead	Lead	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	Harbour Energy	Reference document	PL1114 status report for surrender of production license			Assessment year	2023
This is case no.:	1 of 1	Structural element	Gimsan Basin	Type of trap	Stratigraphic	Water depth [m MSL] (>0)	320	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)	2.00	6.50	9.50	20.00				
	Gas [10^9 Sm^3] (>0.00)					0.30	0.70	1.53	3.50
Recoverable resources	Oil [10^6 Sm^3] (>0.00)	0.80	2.00	3.90	8.50				
	Gas [10^9 Sm^3] (>0.00)					0.12	0.23	0.60	1.40
Reservoir Chrono (from)	Upper Jurassic	Reservoir litho (from)	Rogn Fm.	Source Rock, chrono primary	Upper Jurassic	Source Rock, litho primary	Spekk Fm	Seal, Chrono	Upper Jurassic
Reservoir Chrono (to)	Upper Jurassic	Reservoir litho (to)	Rogn Fm.	Source Rock, chrono secondary		Source Rock, litho secondary		Seal, Litho	Spekk Fm
Probability [fraction]									
Total (oil + gas + oil & gas case) (0.00-1.00)	0.19	Oil case (0.00-1.00)	0.19	Gas case (0.00-1.00)	0.00	Oil & Gas case (0.00-1.00)	0.00		
Reservoir (P1) (0.00-1.00)	0.50	Trap (P2) (0.00-1.00)	0.60	Charge (P3) (0.00-1.00)	0.90	Retention (P4) (0.00-1.00)	0.70		

Parametres:	Low (P90)	Base	High (P10)
Depth to top of prospect [m MSL] (> 0)		3000	
Area of closure [km^2] (> 0.0)			
Reservoir thickness [m] (> 0)			
HC column in prospect [m] (> 0)	190	285	385
Gross rock vol. [10^9 m^3] (> 0.000)	0.820	0.900	1.050
Net / Gross [fraction] (0.00-1.00)	0.40	0.50	0.60
Porosity [fraction] (0.00-1.00)	0.13	0.15	0.17
Permeability [mD] (> 0.0)	0.1		
Water Saturation [fraction] (0.00-1.00)	0.25	0.30	0.3500
Bg [Rm3/Sm3] (< 1.0000)			
1/Bo [Sm3/Rm3] (< 1.00)	0.55	0.62	0.73
GOR, free gas [Sm^3/Sm^3] (> 0)			
GOR, oil [Sm^3/Sm^3] (> 0)	100	169	239
Recov. factor, oil main phase [fraction] (0.00-1.00)	0.30	0.40	0.50
Recov. factor, gas ass. phase [fraction] (0.00-1.00)	0.30	0.40	0.50
Recov. factor, gas main phase [fraction] (0.00-1.00)			
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)			

Comments

For NPD use:					
Temperature, top res [°C] (>0)		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)		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

Table 4.3 Fortune lead resources table

5 Technical assessment

A detailed technical-economic evaluation was performed for the Serendipity prospect.

The exploration strategy comprised a vertical exploration well drilled by either a semi-sub or a jack-up rig. The proposed development solution was a subsea tie-back to Njord located 7 km southwest of the prospect. Two producers and two injectors are planned. Producers were planned to be placed high on the structure and pressure maintenance was planned with a combination of high-angle injector wells placed down flank and a connected aquifer.

The evaluation demonstrates that the mean recoverable resources at 65 mmboe are larger than the estimated B/E reserves for the prospect. The chance of success, Pg is evaluated as relatively high at 31%, but individual risk factors, such as seal at 65% and reservoir at 70% carry considerable risk. As a result the licence partners have not been able to reach a decision to drill the Serendipity prospect.

6 Conclusion

The prospectivity within licence PL 1114 has been thoroughly evaluated over 4 years and all the licence commitments have been fulfilled. The expected hydrocarbon phase is oil and the mean recoverable volume at 65 mmboe in the base case show it is economic. The chance of success is evaluated as relatively high at 31%, but the operator and the partners have different views on the key risk factors. Whilst seal, set at 65%, represents the main risk for the operator, the partners of the licence also consider reservoir as a considerable risk. As a result the licence partners have not been able to reach a decision to drill the Serendipity prospect, and the partnership has unanimously decided to relinquish PL 1114 in its entirety.