PL1033
Surrender Report

OMV

Table of Contents

List of Figures

List of Tables

1 Key License History

Summary

Production License (PL) 1033 is located close to the tripple-junction between Norway, UK and Denmark, in the southern North Sea (Figure 1.1). PL1033 was awarded on February 14th, 2020, as a part of the 2019 APA Round. The initial period for the license was valid until February 14th 2027. The license partnership consisted of OMV (Norge) AS (Operator) and Chrysaor Norge AS, while the license interest between the two companies was as follows:

- OMV (Norge) AS - 60%
- Chrysaor Norge AS - 40%

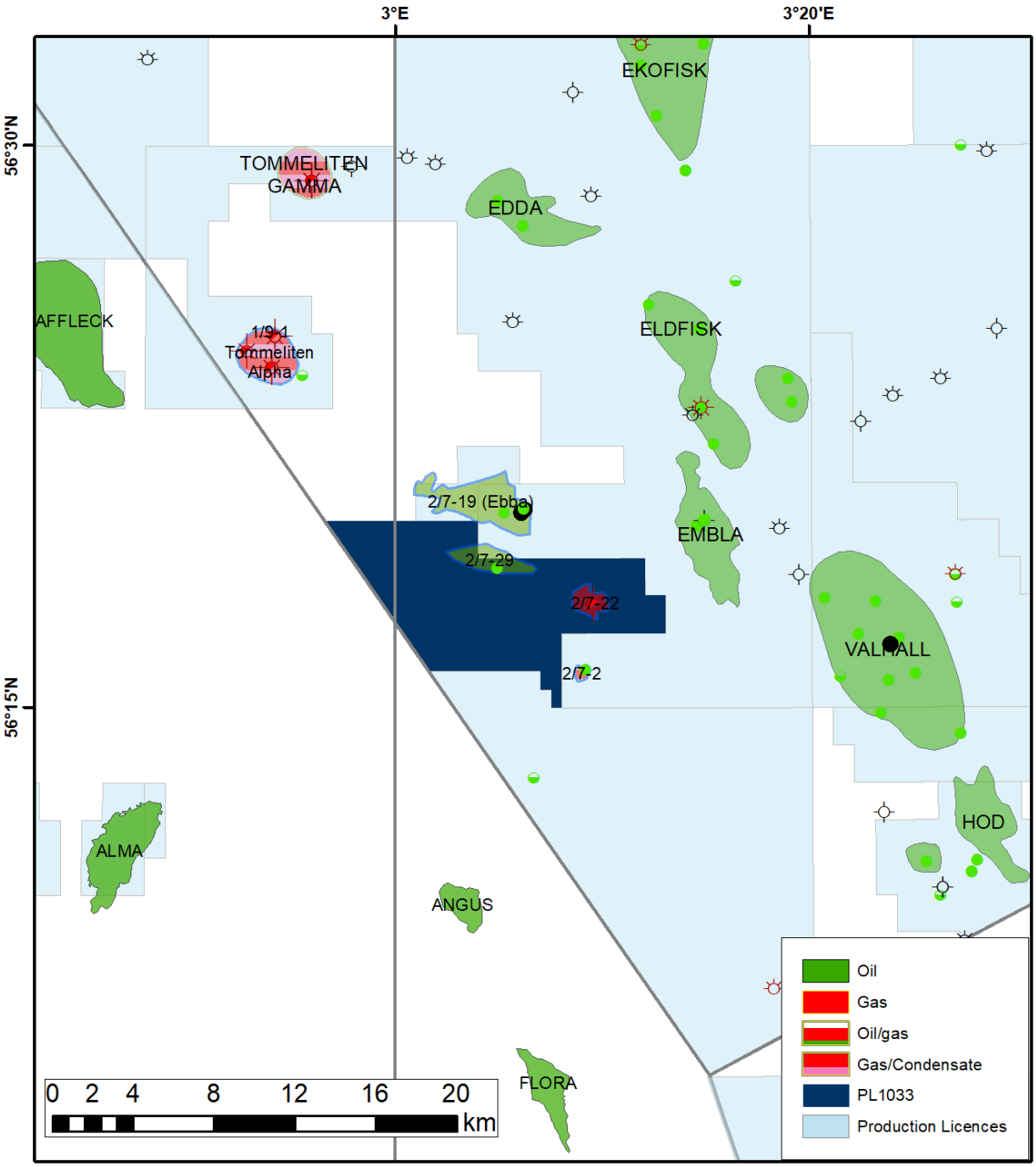

Figure 1.1 Overview map PL1033 and surrounding areas

The initial work program in the license was as follows:

- Phase 1: Within two years (by February 14th 2022), reprocess 3D seismic data, G&G studies and make a drill or drop decision.
- Phase 2: Within two years (by February 14th 2024), drill exploration well and take decision to concretize (BoK).
- Phase 3: Within two years (by February 14th 2026), carry out conceptual studies and take decision to continue (BoV).
- Phase 4: Within one year (by February 14th 2027), prepare plan for development and submit plan for development (PDO).

Work Commitment

The work programme for the initial phase of the license was fulfilled by the reprocessing of 272 km^2 3D seismic data and finalization of several G&G studies.

Meetings held

Since award of license PL1033, a number of meetings took place and are listed below.

- 16.04.2020 - EC / MC Meeting
- 11.06.2020 - EC / MC Meeting
- 26.11.2020 - EC Work Meeting
- 30.04.2021 - EC Work Meeting
- 10.05.2021 - EC Work Meeting
- 26.05.2021 - EC / MC Meeting
- 14.06.2021 - EC Work Meeting
- 30.11.2021 - EC / MC Meeting

Reasons for license relinquishment

The work program of the initial phase was completed by the reprocessing of 3D seismic data and completion of G&G studies. The G&G studies include: Permian reservoir study, Jurassic correlation study, seismic reservoir characterization study, detailed fault seal analysis, petroleum systems analysis.

The aim of these thorough investigations was to mature the Nanna prospect towards the drill or drop decision. All study results helped to understand the prospectivity in the license better, especially the seismic reprocessing and the Permian reservoir study which details the reservoir quality of the Auk Formation in the area. The Auk Formation reservoir is regarded as very challenging in terms of deliverability of commercial hydrocarbon volumes in PL1033. The seismic reprocessing allowed for more confident mapping of the Auk Formation reservoir, but resulted in reducing the area of structural closure of the Nanna prospect. Unfortunately, this resulted in uneconomic volumes for the prospect and leads in the license. Therefore, the operator proposed to drop the license in Phase 1.

2 Database

Seismic data

The common seismic database is comprised of the multiclient 3D dataset MC3D-CGR2012. (Table 2.1, Figure 2.1). The objective of the seismic reprocessing project was to improve seismic imaging of the Nanna prospect in order to de-risk and make it a viable drilling opportunity. Nanna is a geologically complex prospect in that it is fault-bounded, compartmentalised and located at great burial depths. Seismic imaging and therefore trap definition was identified as a key risk of the prospect at an early stage of the project. The resulting reprocessed seismic dataset is named MC3D-CGR2012OMVR21 and has a total area of 272 km^2. The overall data quality of the reprocessed dataset is considered to be good to very good and is the main dataset used for interpretation. Significant uplift in fault imaging was achieved for the faults defining the Nanna prospect when comparing the reprocessed data to older multiclient data examples. 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.

Table 2.1 Seismic database

Survey name	2D/3D	Year	Version	Quality	NPDID
MC3D-CGR2012	3D	2012	Final migration/ Angle Stacks/gathers	Moderate to good	7557
MC3D-CGR2012OMVR21	3D	2021	Final migration/ Angle Stacks/gathers	Good to very good	

Well data

The well database is summarized in Table 2.2 and these well locations are marked yellow in Figure 2.1. Among the most important wells for the evaluation of the Nanna prospect are offset wells 2/7-2, 2/7-22, 2/7-29, 2/7-31 and 2/10-2 respectively which penetrated the Permian Rotliegend Group and were used to generate the depositional model. Wells 2/4-20 and 2/4-22 S were used as part of a seismic reservoir characterization study due to the availability of shear logs. All other wells listed in Table 2.2 were used for regional seismic mapping and correlation of main reservoir units.

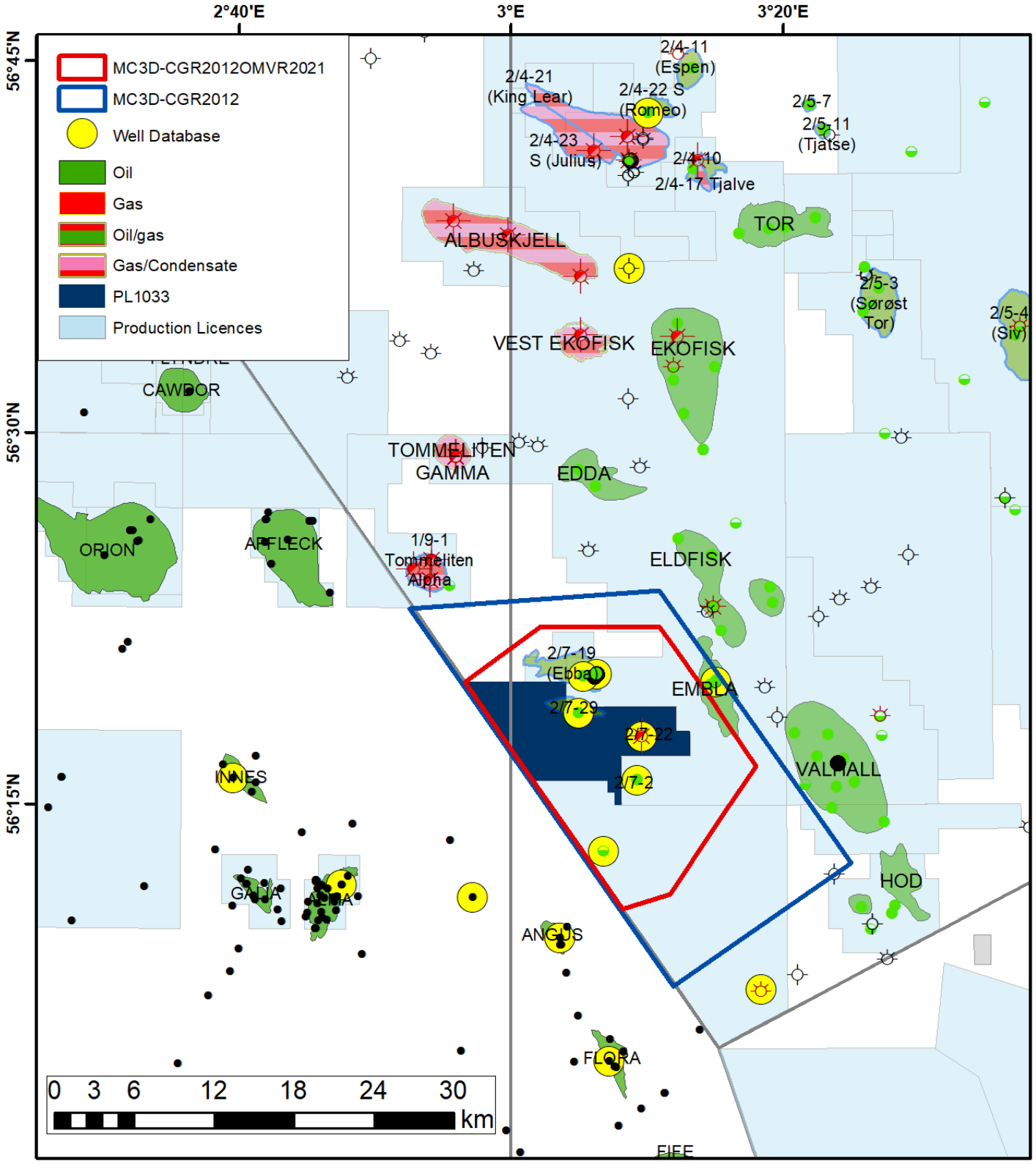

Figure 2.1 Common database

Table 2.2 Common well database

Key wells marked in yellow

Well	Completion Year	Operator	Informal Name	Target (Pre Drill)	Target (Post Drill)	Well Results	TD formation	TD (MD) [m]	OMV Access	NPDID	Comments
2/4-20	2008	ConocoPhillips		Jurassic/Permian	Jurassic/Permian	Dry	Rotliegend Group	5673	Traded	5556	Tie for reservoir parameters and rock physics modelling
2/4-22S	2015	Statoil	Romeo	Rotliegend Group	Jurassic/Permian	Discovery	Rotliegend Group	4889	Traded	7535	Tie for reservoir parameters and rock physics modelling
2/7-2	1971	Phillips Petroleum Company Norway		Paleocene, Cretaceous, Jurassic, Permo-Triassic	Tor Formation	Discovery	Rotliegend Group	3964	Released > 20 Years	187	Tie for regional interpretation, reservoir parameters, depositional model and basin modelling. Vshale input for fault seal analysis
2/7-9	1974	Phillips Petroleum Company Norway	Embla	Late Cretaceous & Jurassic	Permian/ Devonian	Discovery	Devonian	4448	Released > 20 Years	268	Tie for regional interpretation
2/7-19	1981	Phillips Petroleum Company Norway	Ebba	Cretaceous, Jurassic	Ula Formation	Discovery	Zechstein Group	4876	Released > 20 Years	1367	Tie for regional interpretation, reservoir parameters, depositional model and basin modelling
2/7-21S	1990	Phillips Petroleum Company Norway	Embla	Permian/ Devonian	Permian/ Devonian	Discovery	Devonian	5038	Released > 20 Years	1394	Tie for Regional Interpretation
2/7-22	1990	BP Petroleum Dev. of Norway AS		Ula Formation	Devonian/ Permian/ Jurassic	Discovery	Devonian	4750	Released > 20 Years	1495	Tie for regional interpretation, reservoir parameters, depositional model and basin modelling. Vshale input for fault seal analysis
2/7-23S	1990	Phillips Petroleum Company Norway	Embla	Permian/ Devonian	Permian/ Devonian	Discovery	Devonian	4760	Released > 20 Years	1547	Tie for Regional Interpretation
2/7-29	1994	BP Norway Limited		Jurassic sandstones	Jurassic sandstones	Discovery	Rotliegend Group	4900	Released > 20 Years	2124	Tie for regional interpretation, reservoir parameters, depositional model and basin modelling. Core data used in reservoir study
2/7-31	1999	Phillips Petroleum Company Norway	Ebba	Rotliegend Group & Ula Formation	Tuxen Formation, Ula Formation, Rotliegend Group	Discovery	Rotliegend Group	4968,2	Released > 20 Years	3573	Tie for regional interpretation, reservoir parameters, depositional model and basin modelling. Core data used in reservoir study
2/10-1S	1976	Phillips Petroleum Company Norway		Early Cretaceous & Late Jurassic	Early Cretaceous & Late Jurassic	Shows	Carboniferous	4609	Released > 20 Years	284	Tie for regional interpretation and reservoir parameters
2/10-2	1993	Saga Petroleum ASA		Late Jurassic	Late Jurassic	Shows	Rotliegend Group	4164	Released > 20 Years	2050	Tie for regional interpretation, reservoir parameters, depositional model and basin modelling. Vshale input for fault seal analysis. Core data used in reservoir study
30/24-3	1972	Hamilton	Argyll		Permian	Discovery		3060		NA	Tie for Regional Interpretation
30/24-24	1983	Hamilton	Innes		Permian	Discovery		3970		NA	Tie for Regional Interpretation
30/25b-3	1986	Phillips Petroleum		Early Jurassic	Permian	Dry		4000		NA	Tie for regional interpretation and reservoir parameters
31/26-3	1983	Amerada Hess	Angus		Late Jurassic	Discovery		3560		NA	Tie for Regional Interpretation
31/26a-12	1997	Amerada Hess	Flora		Carboniferous	Discovery		2880		NA	Tie for Regional Interpretation

3 Review of Geological and Geophysical Studies

Nanna is a geologically complex prospect in that it is fault bounded with many internal faults and located at great burial depths. Seismic imaging and therefore trap definition, was identified early on as posing a key risk with high uncertainty for the prospect. Better imaging of faults was required to define a robust trap and to evaluate the risk of fault seal leakage. In addition, PL1033 work program included a number of geological studies: sedimentary and reservoir; source and migration and fault seal, with focus on derisking the two main risk elements, namely fault seal and reservoir quality.

Permian reservoir study

Reservoir quality was initially considered as one of the major risks owing to the deep burial of reservoir within the prospect area. Therefore, a reservoir quality and sedimentology study was carried out by CGG Robertsson and OMV to understand the associated risk with the reservoir quality. Integrated chemostratigraphic, petrophysical, sedimentological and regional data resulted in a coeval mixed fluvial/alluvial and aeolian depositional model for the Permian Auk Formation (Figure 3.1). The best reservoir quality based on both Conventional Core Analysis (CCA) and petrophysics can be found within the braided channel and aeolian dune geobodies, but these can also display poor reservoir properties. Based on core data from wells 2/7-29, 2/7-31 and 2/10-2, no measured permeabilities above 2 mD was evident and petrophysically calculated permeabilities were also rarely above 2 mD. Helium CCA porosities and petrophysically calculated effective porosities range from 4%-18%. The average effective porosity in the Auk Formation reservoir is notably around 12% for all the key wells, despite the range in current depths of resevoir seen in these wells. This highlights that there is no direct observable porosity loss trend with burial depth and indicates that feldspar dissolution is an important process due to enhancement of reservoir quality through secondary porosity generation. In terms of the reservoir quality controlling parameters, compaction asserts the strongest control whilst a lesser reservoir quality controlling parameter is cementation. Fluvial/alluvial and aeolian desert facies each have unique controls on reservoir quality. Aeolian deposits exhibit an early anhydrite/gypsum cement, while fluvial deposits exhibit greater amounts of illite and kaolinite that reduce porosity and permeabilities. The reservoir study was used to define input ranges for petrophysical parameters used in the hydrocarbon volume estimation.

Jurassic correlation study

Correlation of the different Jurassic sandbodies discovered in wells 2/7-29, 2/7-22 and 2/7-31 was considered challenging in the license. Therefore, a correlation study was carried out by CGG Robertson and OMV to understand the Jurassic discoveries in the license. The main aim was to investigate whether the Jurassic sandbodies display similar chemostratigraphic, mineralogical and electrofacies properties and are therefore correlatable. The key result is that the thick Eldfisk sandbodies in wells 2/7-29 and 2/7-22 are believed to be correlatable and represent an upper/later sandstone depositional interval within the Late Jurassic, whilst the Ula and Bryne formation sandbodies in well 2/7-31 represent an lower/early sandstone depositional interval within the Middle to Late Jurassic that correlate to the basal sandstone in well 2/7-29 (Figure 3.2). The main reservoir in wells 2/7-22 and 2/7-29 is believed to be of the same interval, however both seismic interpretation and the hydrocarbon phase indicate that they are two separate discoveries.

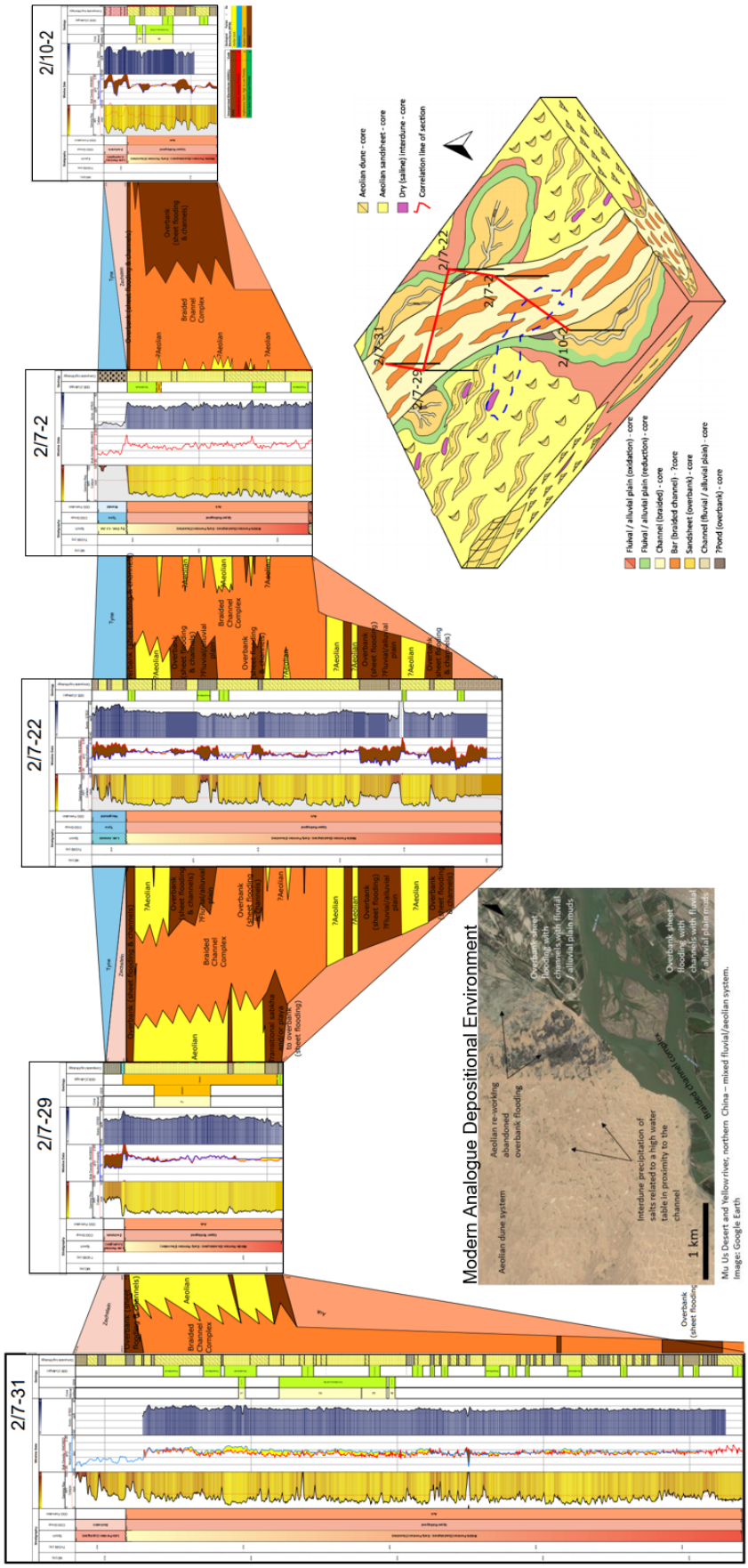

Figure 3.1 Auk formation depositional model and well correlation

Spatially constrained depositional model for the Auk formation.

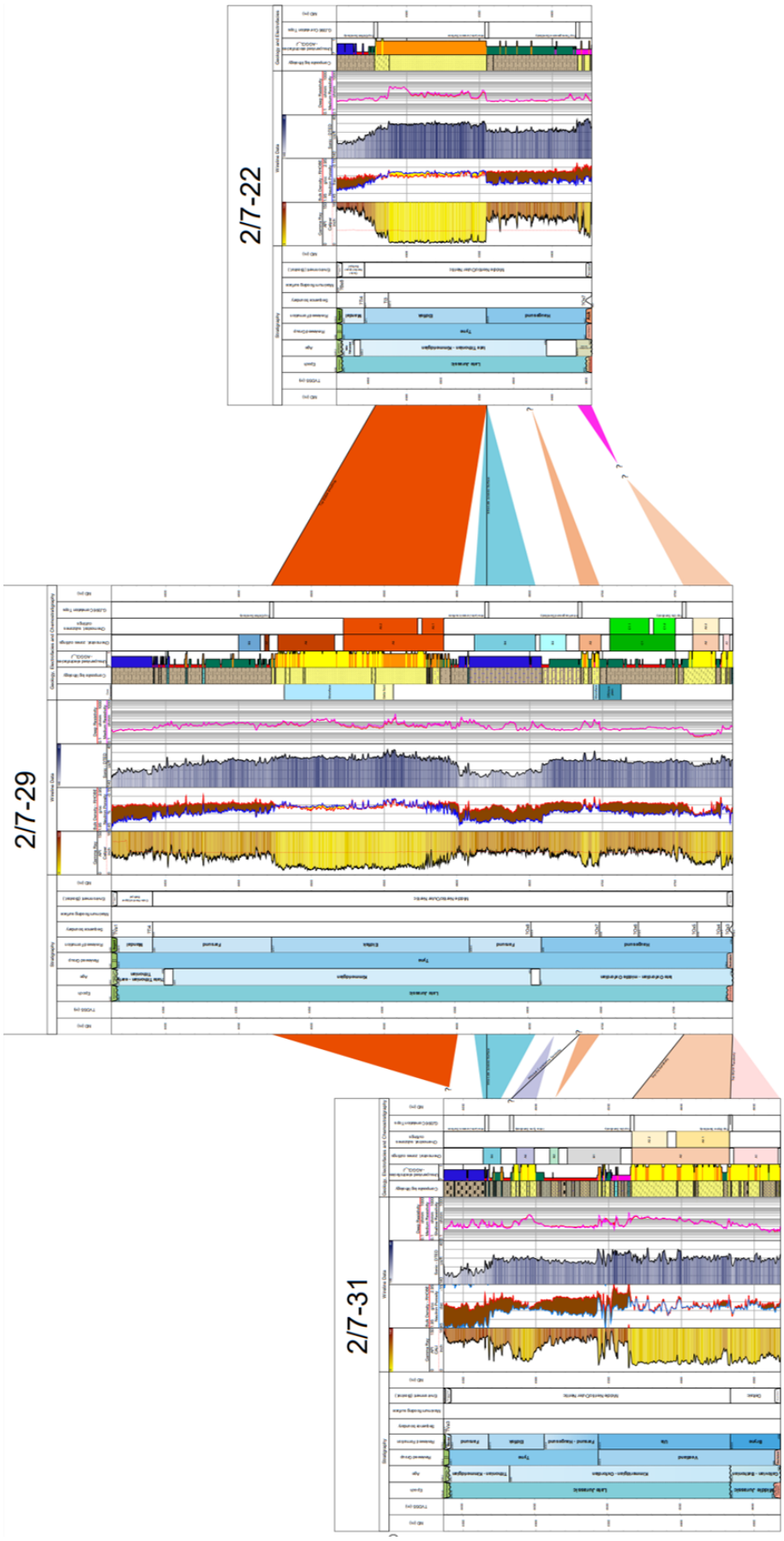

Figure 3.2 Jurassic correlation study

Seismic reservoir characterization study

A seismic reservoir characterization study was initiated by CGG Robertson and OMV to evaluate if it was possible to separate lithology in the seismic data. A rock physics model was used to create elastic responses for various plausible porosity and fluid scenarios at the Nanna prospect, followed by Monte Carlo simulation to assess and quantify the uncertainty associated with each input parameter. Lithofacies classification feasibility tests were run to validate the rock physics model against the real seismic data by combining logs generated from rock physics and Monte Carlo simulation, analysing the AI vs VpVs cross-plot and building probability distribution (PDF) for each facies. The PDF test results show that a good separation between lithology (reservoir from non-reservoir) and fluid (oil from brine sands) is possible at both log and seismic resolution, with some overlap between each facies (Figure 3.3). The overlap between the predicted facies will lead to uncertainty in the final facies prediction, however the uncertainty can be quantified giving us a measure of confidence in the result. Lithofacies classification of synthetic data and real data shows that the PDF derived from the rock physics modelled logs and synthetic points can predict expected scenarios (in-situ and RPM) facies at both log and seismic resolution. There is a good consistency between geological classes and lithology classes designed in the seismic reservoir characterization study.

Fault seal analysis

The eastern prospect bounding fault (Figure 3.4) was analysed for its seal effectiveness. The fault is 8,5 km long and has a maximum displacement of 170 m close to the southern tip of the Nanna prospect. The eastern bounding fault approaches zero displacement at the end of the fault in the north, limiting the prospect size. There is considerable reservoir self-juxtaposition across the fault, making it necessary to invoke a membrane seal in order for the Nanna prospect to close. Two scenarios were calculated to analyse the membrane seal. The first scenario was based solely on well 2/7-2, where the calculated shale gauge ratio is 19% at the shallowest leak point and indicates a questionable membrane seal. Translating the shale gauge ratio into hydrocarbon column height by using the Yielding equation (REF) gives a column height of ~85m at the shallowest leak point (150m from crest). The second scenario was calculated by mixing wells 2/10-2, 2/7-22 and 2/7-2 to capture the variability in the reservoir along the fault length. The calculated shale gauge ratio resulted in ~40% at the shallowest leak point and indicates a more competent membrane seal. Translating the shale gauge ratio into hydrocarbon column height by using the Yielding equation (REF) gives an column height of ~170m at the shallowest leak point (230m from crest).

Petrophysical study

Logtek performed the petrophysical evaluation of key wells and provided output in the form of CPI logs. CGG also performed petrophysical evaluations as part of the Permian reservoir study. These logs were then used as input for fault seal analysis and to define input ranges for petrophysical parameters used in the hydrocarbon volume estimation.

Petroleum systems analysis and basin modeling study

Based on all the basin modeling work that had been done for the APA 2019 license application, a more detailed geochemical study was carried out. The most likely migration route for hydrocarbons into the Nanna prospect from the kitchen to the north is via a fill-spill mechanism. The most likely migration scenario is thought to derive from juxtaposition of Mandal Formation source rock against Auk Formation reservoir along the northern NW-SE trending fault, separating the basin and well 2/7-29 from the horst where Nanna is located (Figure 3.4). The migration requires fill-spill through structures along the way in order to reach the Nanna prospect. An alternative migration scenario is downward migration from the Mandal Formation where it directly overlies the Auk Formation reservoir on the horst. The Mandal source rock is however thin and eroded at certain locations over the horst. Regarding hydrocarbon source, most observed hydrocarbons have a Mandal Formation geochemical signature. The 1D modeling of timing of migration shows that hydrocarbon expulsion from the source rocks within the basin has been occurring uninterruptedly since the Late Paleogene up to present day. Timing therefore is no risk to charge as all structures and traps were in place prior to migration. Hydrocarbon phase is expected to be light oil based on fluid analysis of nearby discoveries.

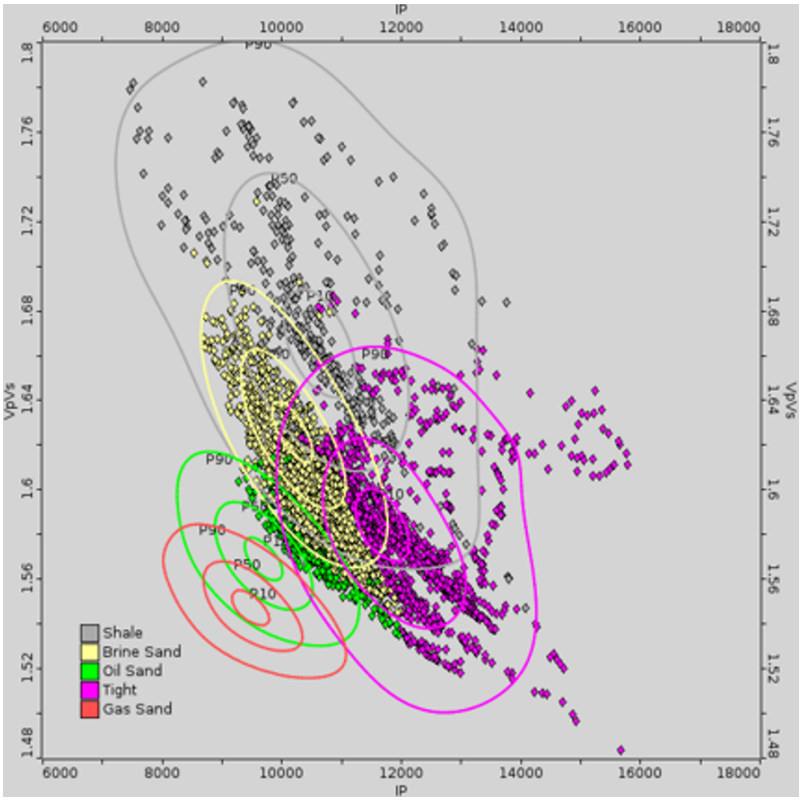

Figure 3.3 AI-Vp/Vs crossplot

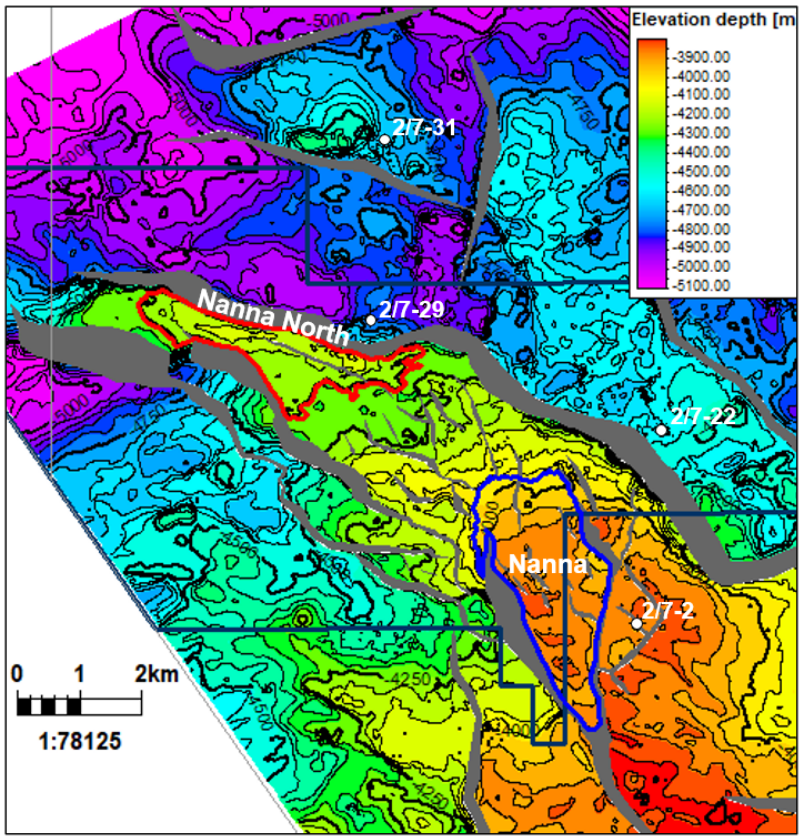

Figure 3.4 Top reservoir depth map with prospect boundary faults

4 Prospect Update

Nanna Prospect

The Nanna prospect is the main prospect identified in the 2019 APA license round and has also been the main focus in the PL1033 license work. The prospect is located on the north-westerly plunging Grensen Nose structure, south of the Feda Graben and west of the Lindesnes Ridge. The Grensen Nose itself is a complex structure, projecting from the Mid North Sea High which lies to the south and south-west of the license.

The Auk Formation reservoir comprises predominantly fluvial/alluvial and aeolian desert sands. The reservoir presence is proven by offset well data. However, the reservoir quality is evaluated to be poor in all wells as highlighted in the Permian reservoir study (3 Review of Geological and Geophysical Studies). A regionally deposited shale layer of the Upper Jurassic Mandal Formation is interpreted to drape the Grensen Nose structure (Figure 4.1 & Figure 4.2). However, the thickness of Mandal Formation is expected to be less than 20 m and is partially missing over the Nanna prospect. The overlying stratigraphy comprises the Åsgard Formation which in the closest key well, 2/7-2, contains traces of sand at the base. The top seal is therefore evaluated to be ambiguous and carries a risk for the Nanna prospect.

In the 2019 APA application, the Nanna prospect was interpreted to cover a large part of the horst north of well 2/7-2. After the seismic reprocessing and a more accurate wellbore location of well 2/7-2, the Nanna prospect was divided into two separate prospects (Nanna and Nanna North, respectively) and thus reducing the overall size of the Nanna prospect (Figure 4.4). Originally, trap definition was identified as the main risk due to the poor quality of the seismic data preventing confident mapping of faults. The quality of the reprocessed seismic is deemed to be superior to the multiclient data, and fault mapping is now more confident. The key element for the resource potential of the Nanna prospect is the overall container size, constrained by the eastern bounding fault where it approaches zero displacement at the northern tip of the fault.

Figure 4.3 shows the Nanna top reservoir map including lowest closing contour for the Nanna Prospect. A comparison of the original prospect outline at license application with the updated one is illustrated in Figure 4.4. As a result of the various G&G studies (3 Review of Geological and Geophysical Studies) the prospect risk parameters have been reassessed with greater confidence. However, unfortunately the majority have been downgraded from the 2019 APA license application. The detailed overview on the updated volumes and risking is given in Table 4.1, the revised prospect form in Table 4.2.

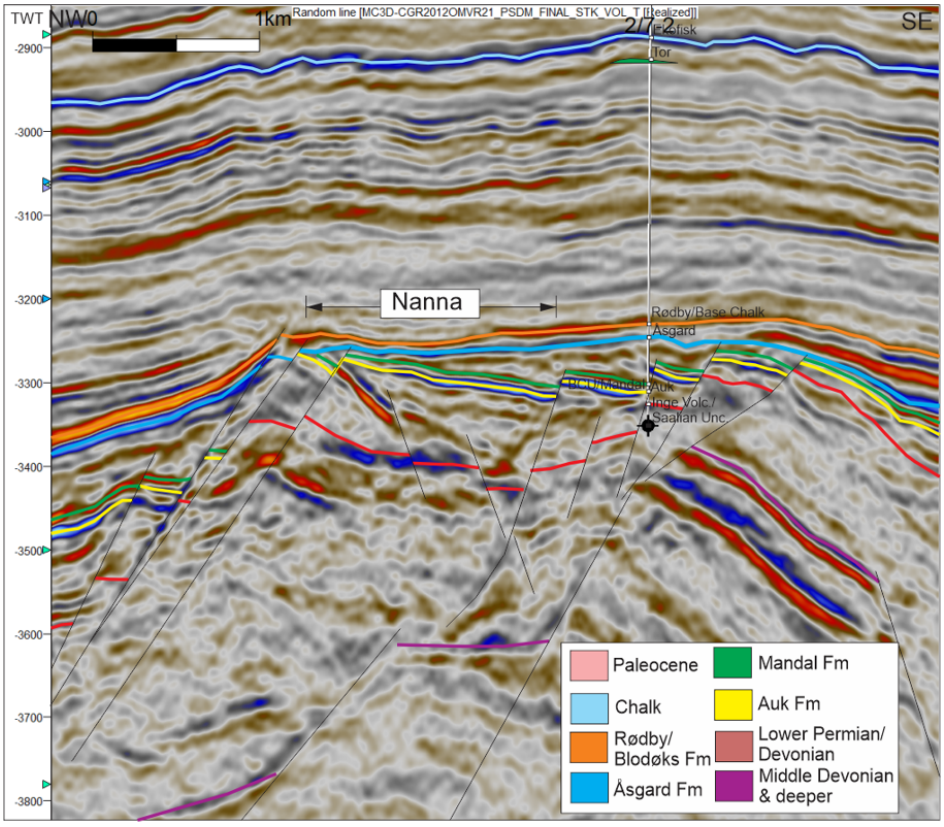

Figure 4.1 Seismic section through Nanna

Location of seismic line see Figure 4.2

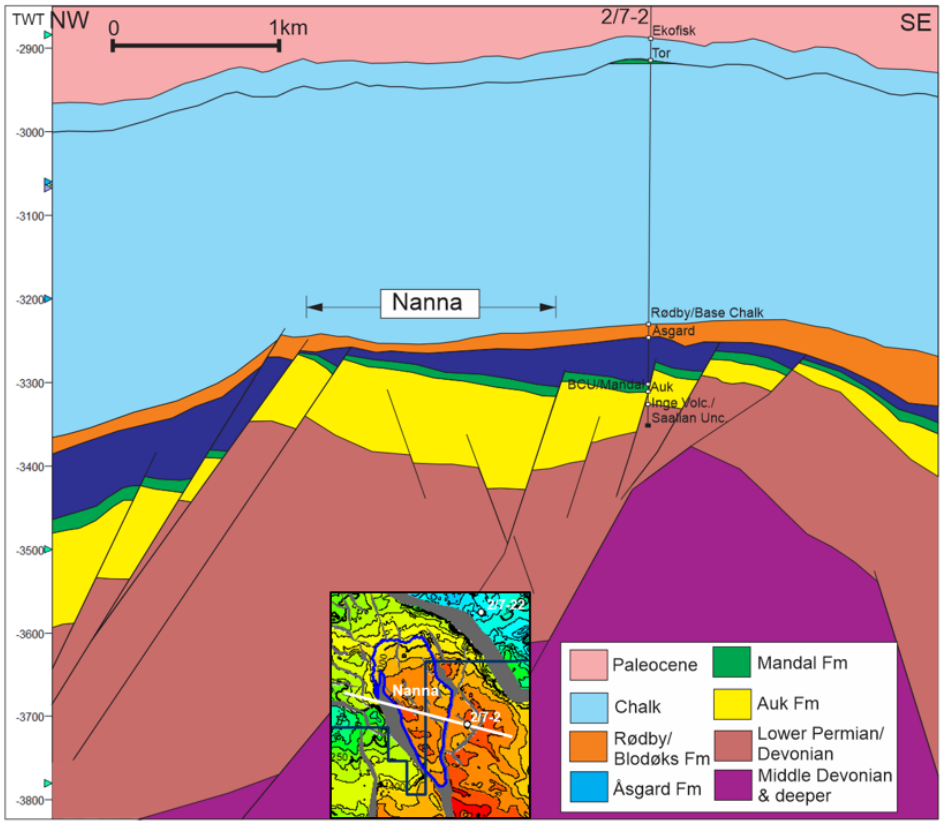

Figure 4.2 Geosection Nanna Prospect

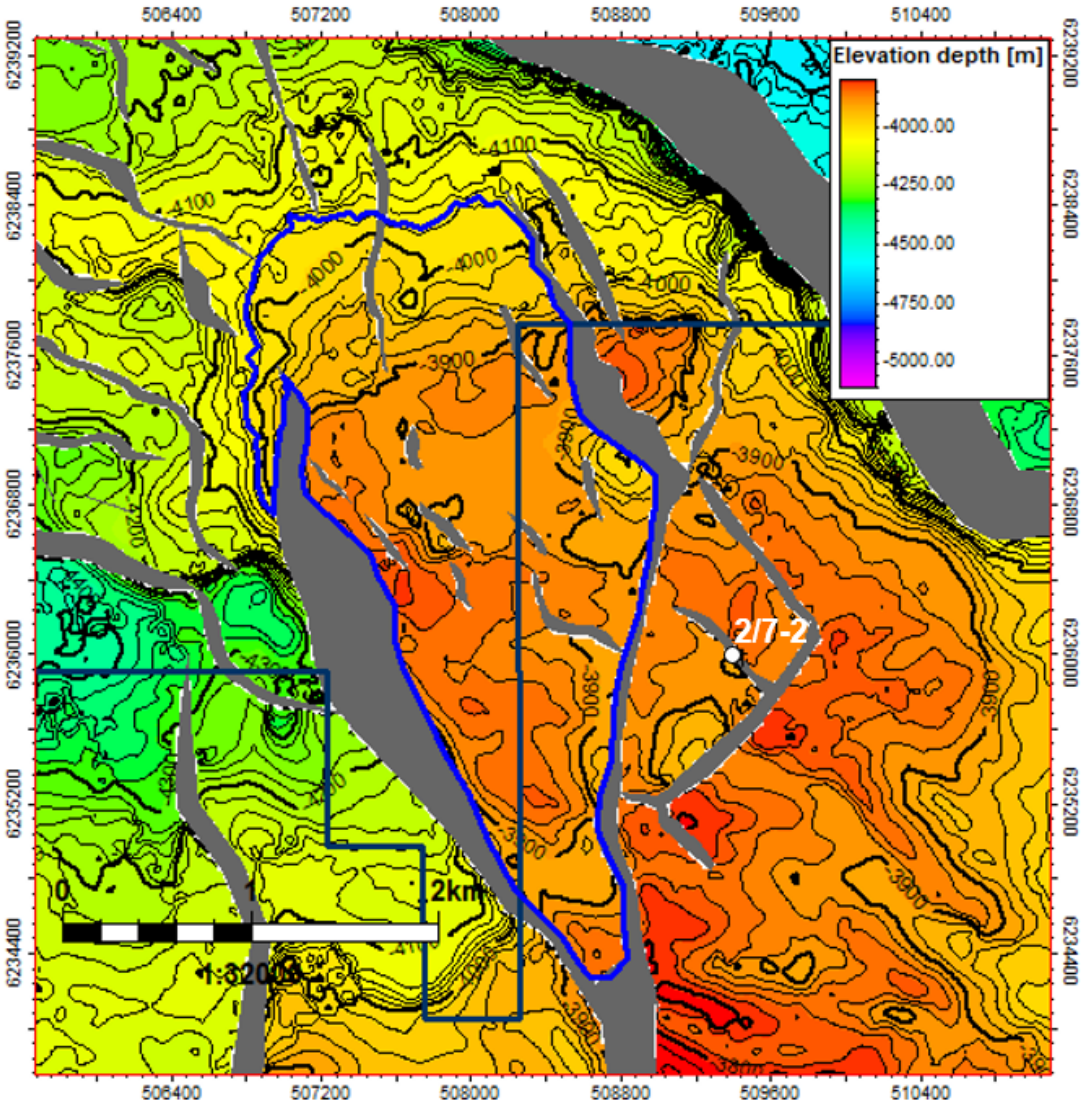

Figure 4.3 Top reservoir (Auk Formation) depth map

Blue outline represents the spillpoint/LCC for the Nanna Prospect. 20 m depth contours.

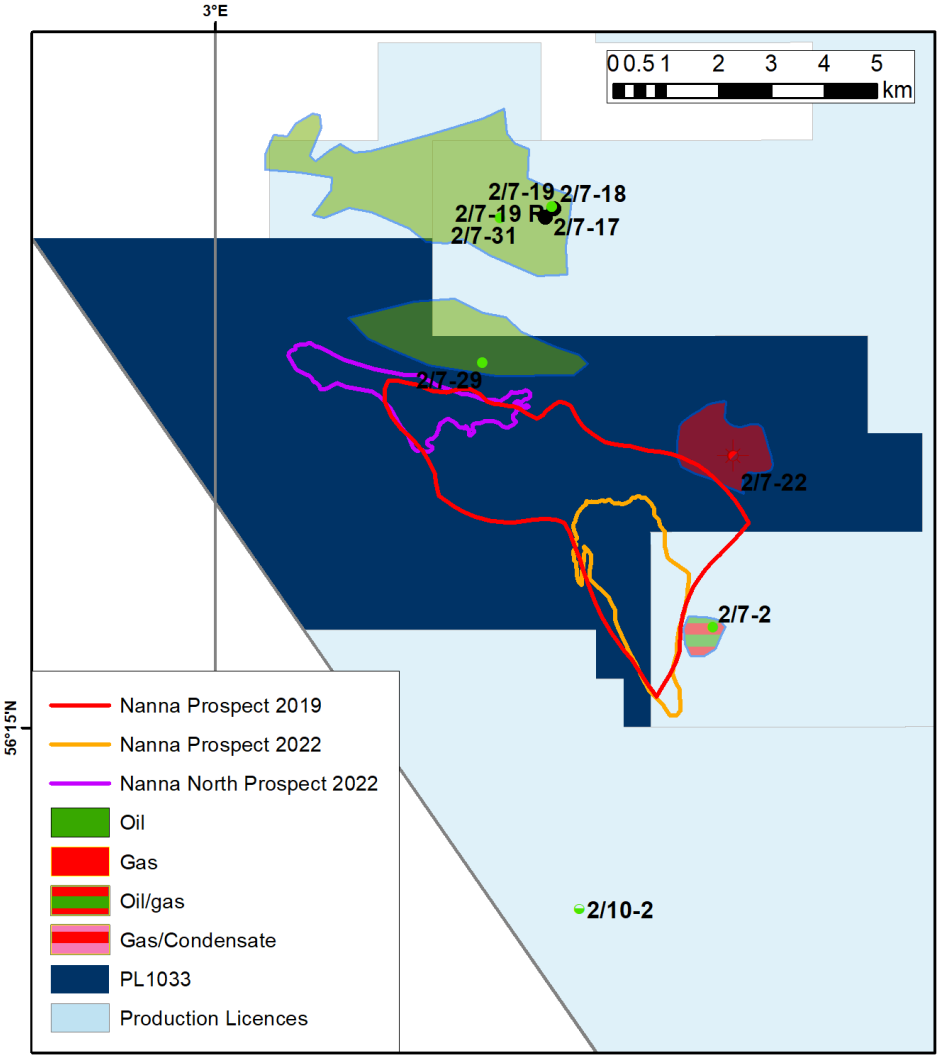

Figure 4.4 Nanna prospect outlines 2019 and 2022

Table 4.1 PL1033 Resource Potential

Updated volume assessment based on study outcomes.

Table 2: Resource Potential

Discovery/ Prospect/ Lead name [1]	D/ P/ L [2]	Case (Oil/ Gas/ Oil&Gas)[3]	Unrisked recoverable resources [4]						Probability of discovery [5] (0.00 - 1.00)	Resources in acreage applied for [%] [6] (0.0 - 100.0)	Reservoir		Nearest relevant infrastructure [8]	
			Oil [10^6Sm^3] (>0.00)			Gas [10^9Sm^3] (>0.00)					Litho-/ Chrono-stratigraphic level [7]	Reservoir depth [m MSL] (>0)	Name	Km (>0)
			Low (P90)	Base (Mean)	High (P10)	Low (P90)	Base (Mean)	High (P10)						
2/7 Nanna	P	Oil	0,03	0,64	1,58	0,01	0,22	0,56	0,15	60,0	Rotliegend Gp/ Permian	3815	Valhall	17
2/7 Nanna North	P	Oil	0,01	0,14	0,41	0,00	0,05	0,14	0,15	100,0	Rotliegend Gp/ Permian	4090	Valhall	17
2/7-29 Discovery	D	Oil	0,05	0,13	0,25	0,02	0,04	0,08	1,00	75,0	Eldfisk Fm/ Upper Jurassic	4290	Valhall	20
2/7-22 Discovery	D	Gas	0,22	0,32	0,43	0,54	0,77	1,09	1,00	100,0	Eldfisk Fm/ Upper Jurassic	4350	Valhall	20

Table 4.2 Revised form for the Nanna prospect

Table 4: Discovery and Prospect data (Enclose map)

Block	2/7	Prospect name	Nanna	Discovery/Prosp/Lead	Prospect	Prosp ID (or New!)	NPD will insert value	NPD approved (Y/N)	
Play name	NPD will insert value	New Play (Y/N)	No	Outside play (Y/N)	No				
Oil, Gas or O&G case:	Oil	Reported by company	OMV Norge AS	Reference document	PL1033 Surrender Report			Assessment year	2021
This is case no.:	1 of 1	Structural element	Grensen Nose	Type of trap	Structural	Water depth [m MSL] (>0)	70	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)	0,99	4,99	5,70	11,20				
	Gas [10^9 Sm^3] (>0.00)					0,31	1,59	1,99	4,18
Recoverable resources	Oil [10^6 Sm^3] (>0.00)	0,03	0,40	0,64	1,58				
	Gas [10^9 Sm^3] (>0.00)					0,01	0,13	0,22	0,56
Reservoir Chrono (from)	Permian	Reservoir litho (from)	Rotliegend Gp	Source Rock, chrono primary	Berriasian	Source Rock, litho primary	Mandal Fm	Seal, Chrono	Berriasian
Reservoir Chrono (to)	Permian	Reservoir litho (to)		Source Rock, chrono secondary		Source Rock, litho secondary		Seal, Litho	Mandal Fm
Probability [fraction]									
Total (oil + gas + oil & gas case) (0.00-1.00)	1,00	Oil case (0.00-1.00)	0,60	Gas case (0.00-1.00)	0,40	Oil & Gas case (0.00-1.00)	0,00		
Reservoir (P1) (0.00-1.00)	0,54	Trap (P2) (0.00-1.00)	0,80	Charge (P3) (0.00-1.00)	0,60	Retention (P4) (0.00-1.00)	0,60		

Parametres:	Low (P90)	Base	High (P10)
Depth to top of prospect [m MSL] (> 0)	3815	3815	3815
Area of closure [km^2] (> 0.0)	2,9	3,6	4,1
Reservoir thickness [m] (> 0)	139	196	252
HC column in prospect [m] (> 0)	62	203	361
Gross rock vol. [10^9 m^3] (> 0.000)	0,414	0,526	0,636
Net / Gross [fraction] (0.00-1.00)	0,41	0,59	0,76
Porosity [fraction] (0.00-1.00)	0,11	0,13	0,15
Permeability [mD] (> 0.0)	0,1	0,2	2,0
Water Saturation [fraction] (0.00-1.00)	0,55	0,49	0,40
Bg [Rm3/Sm3] (< 1.0000)			
1/Bo [Sm3/Rm3] (< 1.00)	0,66	0,51	0,42
GOR, free gas [Sm^3/Sm^3] (> 0)			
GOR, oil [Sm^3/Sm^3] (> 0)	198	347	497
Recov. factor, oil main phase [fraction] (0.00-1.00)	0,02	0,10	0,18
Recov. factor, gas ass. phase [fraction] (0.00-1.00)	0,02	0,10	0,18
Recov. factor, gas main phase [fraction] (0.00-1.00)			
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)			

Temperature, top res [°C] (>0)	135		For NPD use:				
Pressure, top res [bar] (>0)	670		Innrapp. av geolog-init:	NPD will insert value	Registrert - init:	NPD will insert value	Kart oppdatert	NPD will insert value
Cut off criteria for N/G calculation	PHIE>=0.10	Vsh<=0.50	Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
							Kart nr	NPD will insert value

Nanna North Prospect

Figure 4.5 shows the top reservoir depth map including lowest closing contour for the Nanna North prospect. The Nanna North prospect is part of the same play as the Nanna prospect (Figure 4.6). Therefore most of the input parameters for the resource calculation for Nanna North are similar to the parameters used for Nanna. The Nanna North prospect is more favourably positioned for hydrocarbon migration than the Nanna prospect, while the seismic imaging of the reservoir becomes challenging along the northern northwest-southeast trending bounding fault. The reservoir presence for the Nanna North prospect is therefore a slightly higher risk than for the Nanna prospect. The key element for the resource potential of the Nanna North prospect is container size which is constrained by the spillpoint to the southeast. The detailed overview of the volumes and risking is given in (Table 4.3).

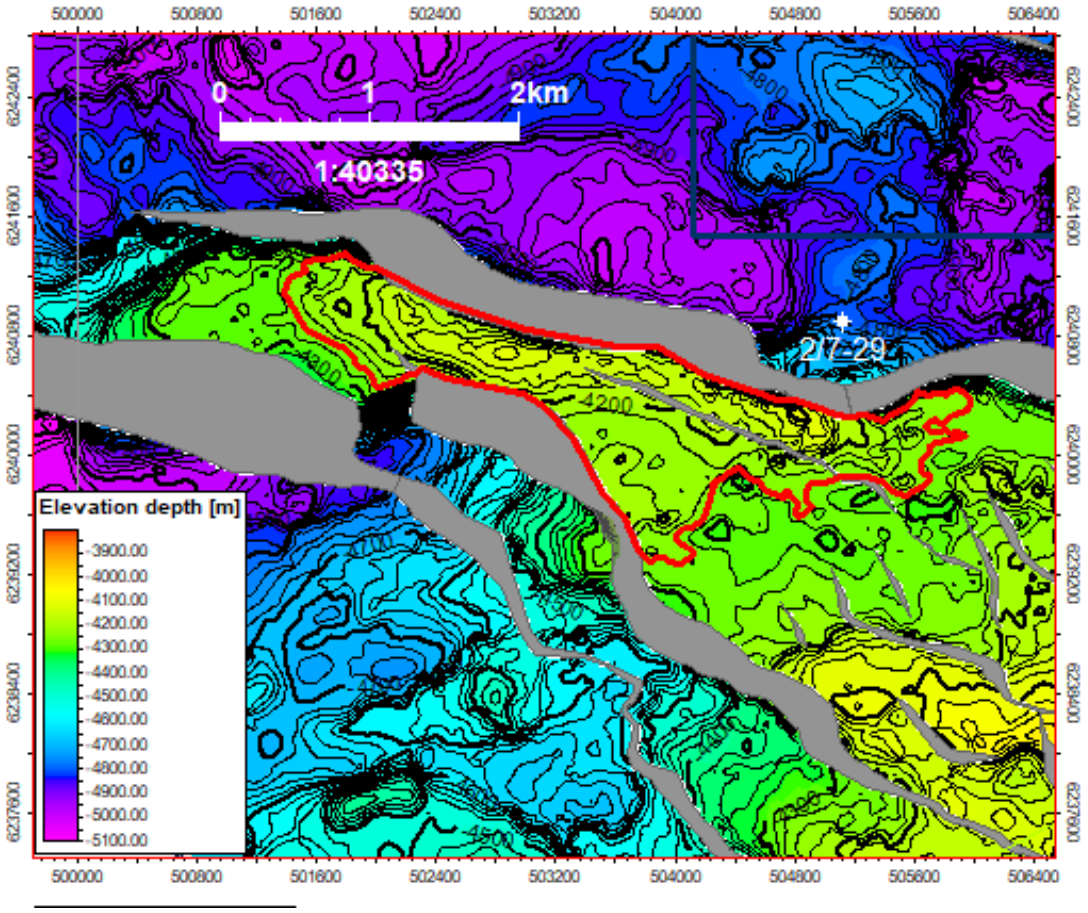

Figure 4.5 Nanna North Prospect

Red outline represents lowest closing contour for the Nanna North prospect. 20 m depth contours.

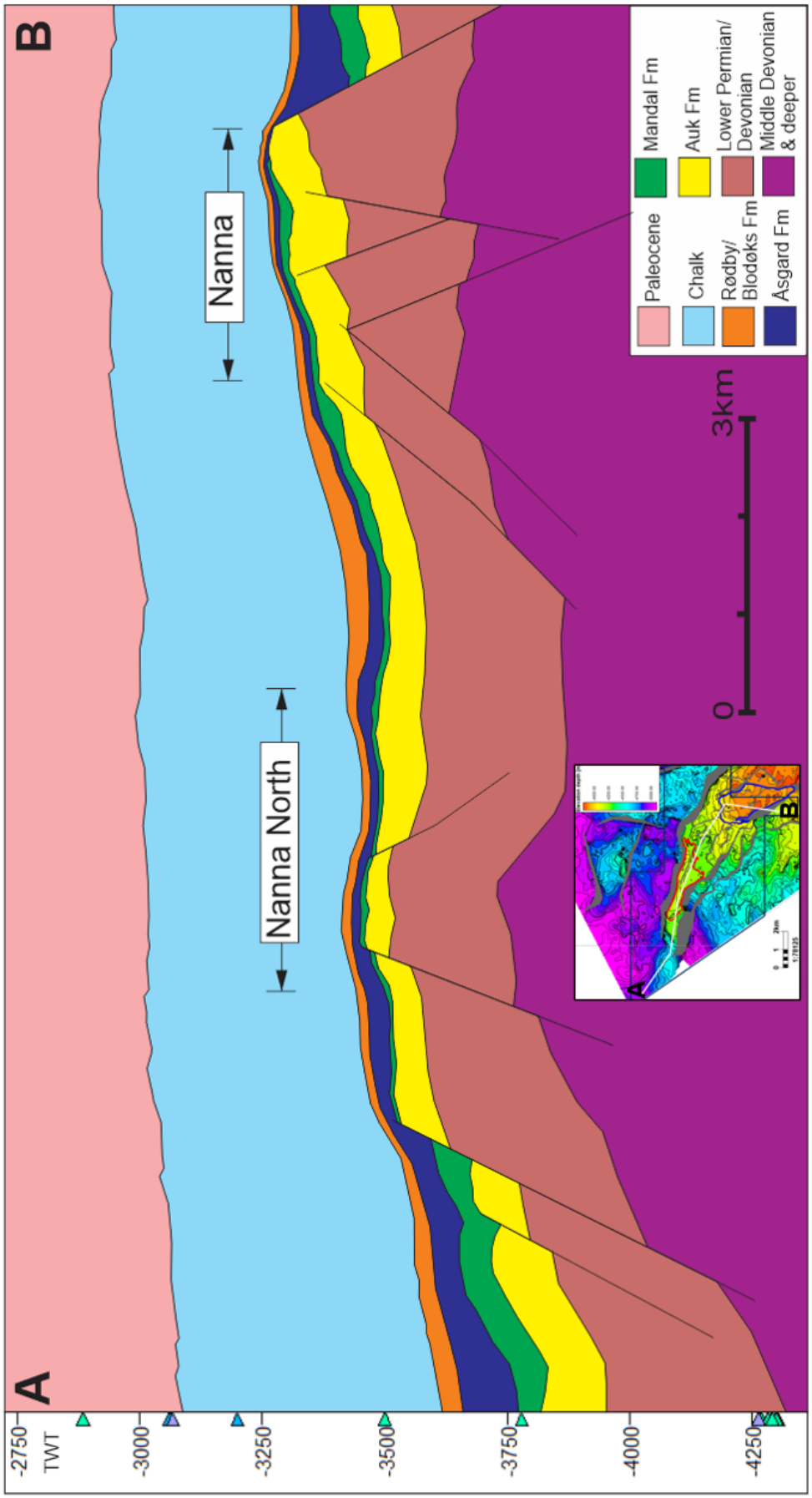

Figure 4.6 Geosection Nanna and Nanna North prospect

Table 4.3 Revised form for the Nanna North prospect

Table 4: Discovery and Prospect data (Enclose map)

Block	2/7	Prospect name	Nanna North	Discovery/Prosp/Lead	Prospect	Prosp ID (or New!)	NPD will insert value	NPD approved (Y/N)	
Play name	NPD will insert value	New Play (Y/N)	No	Outside play (Y/N)	No				
Oil, Gas or O&G case:	Oil	Reported by company	OMV Norge AS	Reference document	PL1033 Surrender Report			Assessment year	2021
This is case no.:	1 of 1	Structural element	Grensen Nose	Type of trap	Structural	Water depth [m MSL] (>0)	70	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)	0,04	0,80	1,28	3,23				
	Gas [10^9 Sm^3] (>0.00)					0,01	0,26	0,44	1,17
Recoverable resources	Oil [10^6 Sm^3] (>0.00)	0,00	0,05	0,14	0,42				
	Gas [10^9 Sm^3] (>0.00)					0,00	0,02	0,05	0,14
Reservoir Chrono (from)	Permian	Reservoir litho (from)	Rotliegend Gp	Source Rock, chrono primary	Berriasian	Source Rock, litho primary	Mandal Fm	Seal, Chrono	Berriasian
Reservoir Chrono (to)	Permian	Reservoir litho (to)		Source Rock, chrono secondary		Source Rock, litho secondary		Seal, Litho	Mandal Fm
Probability [fraction]									
Total (oil + gas + oil & gas case) (0.00-1.00)	1,00	Oil case (0.00-1.00)	0,60	Gas case (0.00-1.00)	0,40	Oil & Gas case (0.00-1.00)	0,00		
Reservoir (P1) (0.00-1.00)	0,48	Trap (P2) (0.00-1.00)	0,75	Charge (P3) (0.00-1.00)	0,70	Retention (P4) (0.00-1.00)	0,60		

Parametres:	Low (P90)	Base	High (P10)
Depth to top of prospect [m MSL] (> 0)	4090	4090	4090
Area of closure [km^2] (> 0.0)	0,1	0,5	1,4
Reservoir thickness [m] (> 0)	139	196	252
HC column in prospect [m] (> 0)	46	112	178
Gross rock vol. [10^9 m^3] (> 0.000)	0,122	0,152	0,181
Net / Gross [fraction] (0.00-1.00)	0,41	0,59	0,76
Porosity [fraction] (0.00-1.00)	0,11	0,13	0,15
Permeability [mD] (> 0.0)	0,1	0,2	2,0
Water Saturation [fraction] (0.00-1.00)	0,55	0,49	0,40
Bg [Rm3/Sm3] (< 1.0000)			
1/Bo [Sm3/Rm3] (< 1.00)	0,66	0,51	0,42
GOR, free gas [Sm^3/Sm^3] (> 0)			
GOR, oil [Sm^3/Sm^3] (> 0)	198	347	497
Recov. factor, oil main phase [fraction] (0.00-1.00)	0,02	0,10	0,18
Recov. factor, gas ass. phase [fraction] (0.00-1.00)	0,02	0,10	0,18
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)	135	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)	670	Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
Cut off criteria for N/G calculation	PHIE>=0.10	Vsh<=0.50				Kart nr	NPD will insert value

2/7-29 Discovery

Well 2/7-29 is a Jurassic discovery in the Eldfisk Formation. The Eldfisk Formation reservoir comprises predominantly shoreface and delta-front sands. The sands are interpreted to be sourced locally from the Grensen Nose high, immediately south-southeast of the discovery. Figure 4.7 shows the top Eldfisk depth map and seismic sections through well 2/7-29 and 2/7-22. Through detailed seismic interpretation, the outline of the discovery has changed from that provided by previous license holders. While the old outline represents a sedimentary wedge of sand rather than the extent of hydrocarbon accumulation, the OMV outline is based on the structure of the reservoir and associated oil column. The updated hydrocarbon volumes are given in Table 4.4.

2/7-22 Discovery

The Permian reservoir study and Jurassic correlation study carried out by CGG and OMV (3 Review of Geological and Geophysical Studies) revealed that the reservoir in the 2/7-22 discovery is likely to be Jurassic in age, and corresponds with the Eldfisk Formation, although ultimate age determination would only be confirmed by sample evaluations. Seismic interpretation also suggests correlatability of the Top Eldfisk Formation between the sands in well 2/7-29 and 2/7-22 (Figure 4.7). The updated hydrocarbon volumes are given in Table 4.5.

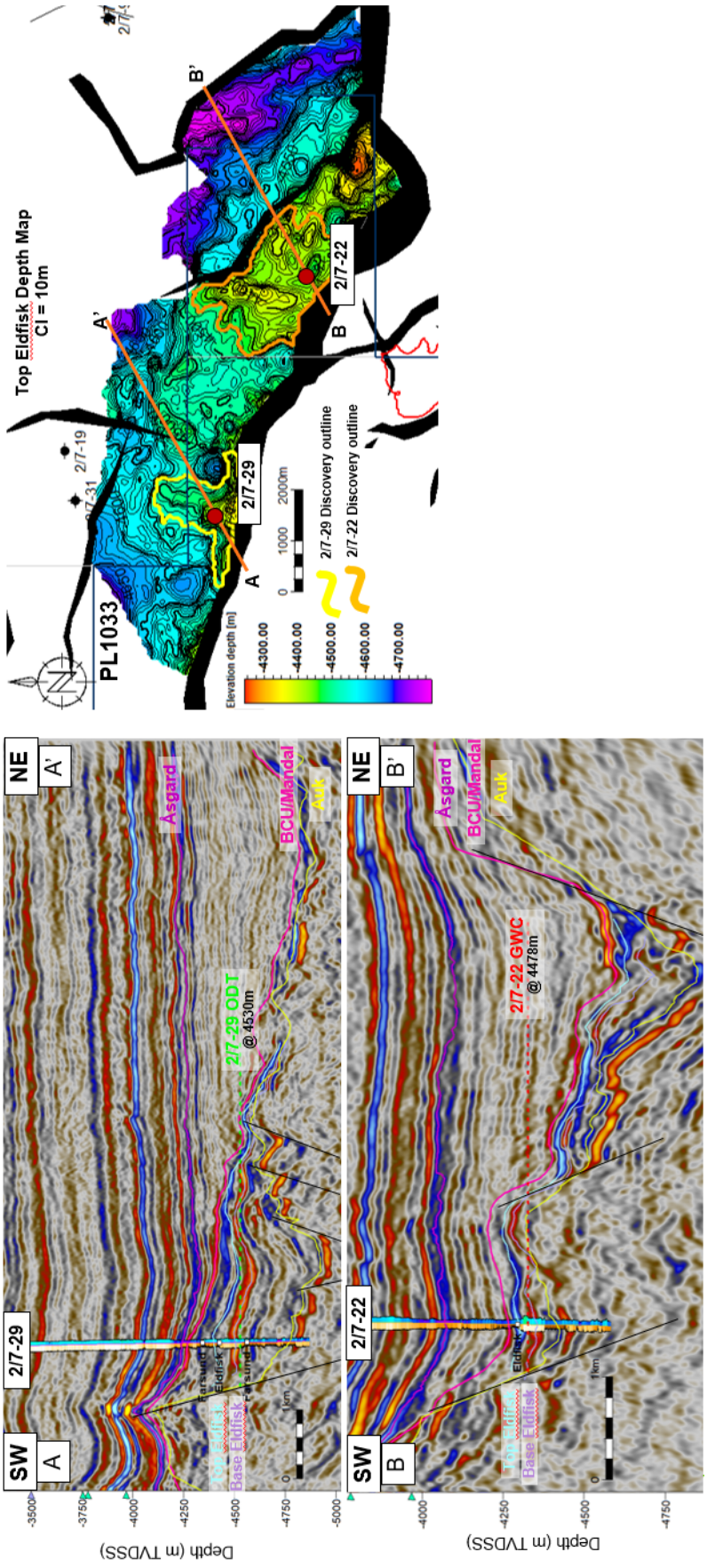

Figure 4.7 Well 2/7-29 & 2/7-22 seismic section and depth map

Well logs displayed include GR on left, Sw on right.

Table 4.4 Revised form for the 2/7-29 discovery

Table 4: Discovery and Prospect data (Enclose map)

Block	2/7	Prospect name	2/7-29 discovery	Discovery/Prosp/Lead	Discovery	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	OMV Norge AS	Reference document	PL1033 Surrender Report			Assessment year	2021
This is case no.:	1 of 1	Structural element	Grensen Nose	Type of trap	Structural	Water depth [m MSL] (>0)	70	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)	0,44	0,75	0,82	1,27				
	Gas [10^9 Sm^3] (>0.00)					0,14	0,26	0,29	0,47
Recoverable resources	Oil [10^6 Sm^3] (>0.00)	0,05	0,11	0,13	0,25				
	Gas [10^9 Sm^3] (>0.00)					0,02	0,04	0,04	0,08
Reservoir Chrono (from)	Jurassic	Reservoir litho (from)	Eldfisk Fm	Source Rock, chrono primary	Berriasian	Source Rock, litho primary	Mandal Fm	Seal, Chrono	Berriasian
Reservoir Chrono (to)	Jurassic	Reservoir litho (to)		Source Rock, chrono secondary		Source Rock, litho secondary		Seal, Litho	Mandal Fm
Probability [fraction]									
Total (oil + gas + oil & gas case) (0.00-1.00)		Oil case (0.00-1.00)		Gas case (0.00-1.00)		Oil & Gas case (0.00-1.00)			
Reservoir (P1) (0.00-1.00)		Trap (P2) (0.00-1.00)		Charge (P3) (0.00-1.00)		Retention (P4) (0.00-1.00)			

Parametres:	Low (P90)	Base	High (P10)
Depth to top of prospect [m MSL] (> 0)	4290	4290	4290
Area of closure [km^2] (> 0.0)	1,0	1,1	1,5
Reservoir thickness [m] (> 0)	100	130	150
HC column in prospect [m] (> 0)	189	196	212
Gross rock vol. [10^9 m^3] (> 0.000)	0,120	0,150	0,180
Net / Gross [fraction] (0.00-1.00)	0,28	0,39	0,51
Porosity [fraction] (0.00-1.00)	0,12	0,13	0,14
Permeability [mD] (> 0.0)	0,3	1,7	10,0
Water Saturation [fraction] (0.00-1.00)	0,61	0,49	0,37
Bg [Rm3/Sm3] (< 1.0000)			
1/Bo [Sm3/Rm3] (< 1.00)	0,44	0,50	0,58
GOR, free gas [Sm^3/Sm^3] (> 0)			
GOR, oil [Sm^3/Sm^3] (> 0)	257	355	450
Recov. factor, oil main phase [fraction] (0.00-1.00)	0,09	0,15	0,22
Recov. factor, gas ass. phase [fraction] (0.00-1.00)	0,09	0,15	0,22
Recov. factor, gas main phase [fraction] (0.00-1.00)			
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)			

Top and base reservoir has been interpreted and used in the volumetric assessment.

Temperature, top res [°C] (>0)	165		For NPD use:				
Pressure, top res [bar] (>0)	770		Innrapp. av geolog-init:	NPD will insert value	Registrert - init:	NPD will insert value	Kart oppdatert	NPD will insert value
Cut off criteria for N/G calculation	PHIE>=0.10	Vsh<=0.50	Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
							Kart nr	NPD will insert value

Table 4.5 Revised form for the 2/7-22 discovery

Table 4: Discovery and Prospect data (Enclose map)

Block	2/7	Prospect name	2/7-22 discovery	Discovery/Prosp/Lead	Discovery	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:	Gas	Reported by company	OMV Norge AS	Reference document	PL1033 Surrender Report			Assessment year	2021
This is case no.:	1 of 1	Structural element	Grensen Nose	Type of trap	Structural	Water depth [m MSL] (>0)	70	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)					1,04	1,38	1,42	1,84
	Gas [10^9 Sm^3] (>0.00)	1,31	1,72	1,76	2,26				
Recoverable resources	Oil [10^6 Sm^3] (>0.00)								
	Gas [10^9 Sm^3] (>0.00)	0,54	0,77	0,80	1,09	0,22	0,31	0,32	0,43
Reservoir Chrono (from)	Jurassic	Reservoir litho (from)	Eldfisk Fm	Source Rock, chrono primary	Berriasian	Source Rock, litho primary	Mandal Fm	Seal, Chrono	Berriasian
Reservoir Chrono (to)	Jurassic	Reservoir litho (to)		Source Rock, chrono secondary		Source Rock, litho secondary		Seal, Litho	Mandal Fm
Probability [fraction]									
Total (oil + gas + oil & gas case) (0.00-1.00)		Oil case (0.00-1.00)		Gas case (0.00-1.00)		Oil & Gas case (0.00-1.00)			
Reservoir (P1) (0.00-1.00)		Trap (P2) (0.00-1.00)		Charge (P3) (0.00-1.00)		Retention (P4) (0.00-1.00)			

Parametres:	Low (P90)	Base	High (P10)
Depth to top of prospect [m MSL] (> 0)	4350	4350	4350
Area of closure [km^2] (> 0.0)	3,5	4,5	5,5
Reservoir thickness [m] (> 0)	60	70	80
HC column in prospect [m] (> 0)	128	128	128
Gross rock vol. [10^9 m^3] (> 0.000)	0,183	0,229	0,276
Net / Gross [fraction] (0.00-1.00)	0,85	0,90	1,00
Porosity [fraction] (0.00-1.00)	0,07	0,07	0,08
Permeability [mD] (> 0.0)	0,3	1,7	10,0
Water Saturation [fraction] (0.00-1.00)	0,44	0,49	0,36
Bg [Rm3/Sm3] (< 1.0000)	0,0035	0,0038	0,0041
1/Bo [Sm3/Rm3] (< 1.00)			
GOR, free gas [Sm^3/Sm^3] (> 0)			
GOR, oil [Sm^3/Sm^3] (> 0)			
Recov. factor, oil main phase [fraction] (0.00-1.00)			
Recov. factor, gas ass. phase [fraction] (0.00-1.00)			
Recov. factor, gas main phase [fraction] (0.00-1.00)	0,37	0,45	0,53
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)	0,19	0,23	0,26

Top and base reservoir has been interpreted and used in the volumetric assessment.

For NPD use:						
Temperature, top res [°C] (>0)	165	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)	770	Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
Cut off criteria for N/G calculation	PHIE>=0.06	Vsh<=0.50				Kart nr	NPD will insert value

5 Technical Evaluations

No new technical economic evaluation regarding potential development of the Nanna Prospect has been performed since the APA license application due to the very low recoverable hydrocarbon volume potential (Table 4.1).

6 Conclusions

The prospectivity within license PL1033 has been thoroughly evaluated and all license commitments have been fulfilled. As a consequence of the work program, the license stakeholders now have a far greater understanding of the Permian Auk Formation play and the Upper Jurassic Eldfisk Formation play in the Grensen Nose & Feda Graben area. As a result of the license work we conclude that the recoverable hydrocarbon volume potential within the Nanna prospect, the Nanna North prospect, and the two Jurassic discoveries is too low to make a viable business case to warrant further work and development. The partnership has unanimously decided to relinquish PL1033 in its entirety.