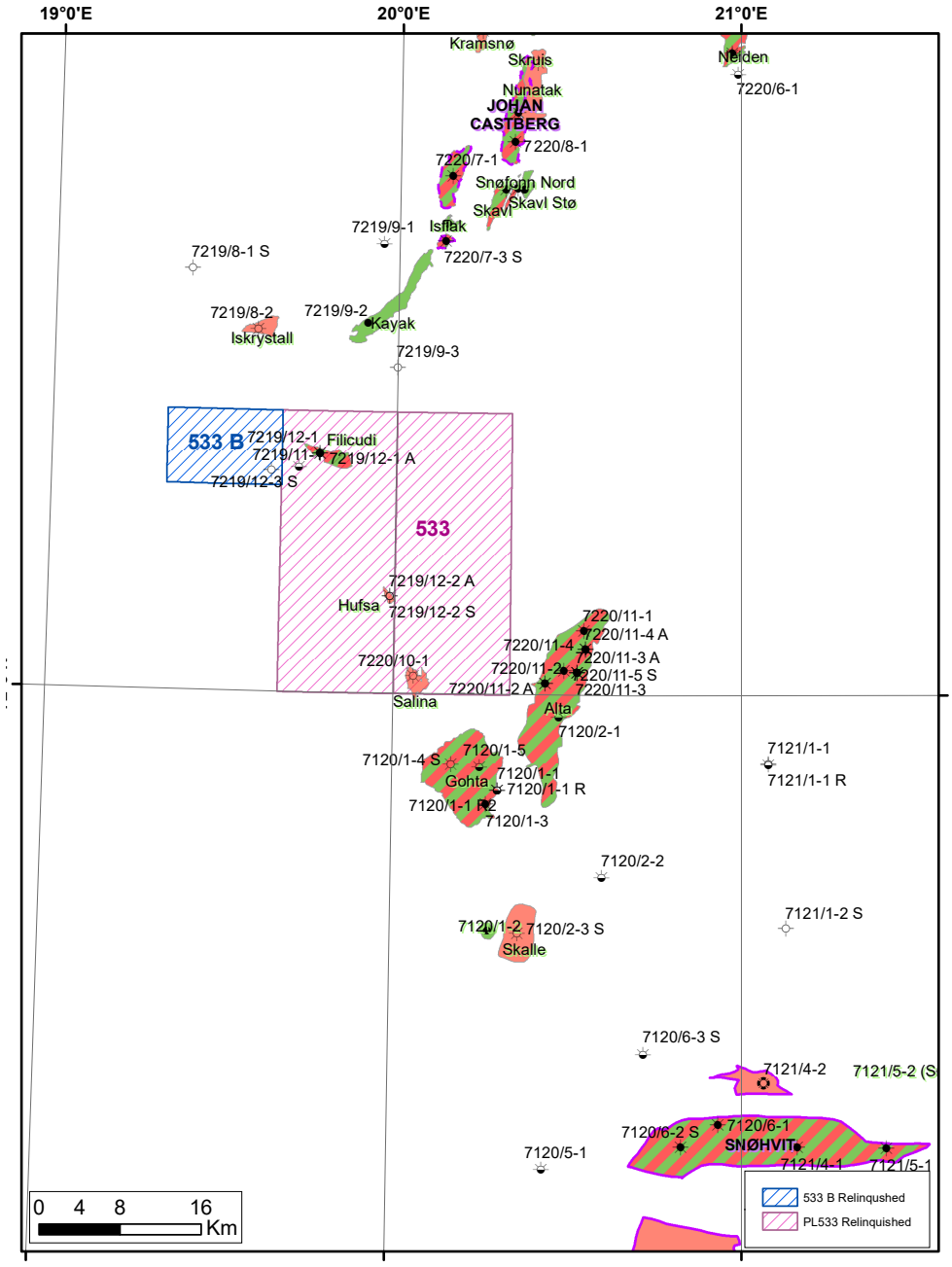
PL 533 & PL 533 B
RELINQUISHMENT REPORT

November 2023



Partner: wintershall dea

1 License history

PL533 was awarded 15.05.2009 to ENI Norge AS (40% and Operator), Det norske oljeselskap (20%), Lundin Norway AS (20%) and RWE Dea Norge AS (20%). Following drilling of the first exploration well, the operatorship was taken over by Lundin Norway AS (35%) with Det norske oljeselskap ASA (35%) and DEA Norge AS (30%) as partners. The following gives an overview of the key terms and conditions, as well as key events in the licence.

General info PL533 and PL533B:

- Date of award PL533: 15.05.2009 (20th licensing round)
- Date of award PL533B: 02.03.2018 (APA 2017)
- PL533; blocks 7219/12 and 7220/10. Total 637.464 km^2
- PL533B:Block 7219/11. Total 84.574 km^2
- Licensees at award PL533: ENI Norge AS (40% Operator), Det norske oljeselskap (20%), Lundin Norway AS (20%), RWE Dea Norge AS (20%)
- Licensees at award PL533B: Lundin Norway AS (35% Operator), Aker BP ASA (35%), DEA Norge AS (30%)
- Licensees at relinquishment: ABP Norway AS (40% Operator), Aker BP (35%), Wintershall Dea Norge AS (25%)

Work commitments PL533:

- Acquisition/purchase 3D seismic within 3 years from award.
- Drill one exploration well 100 meters into the Snadd Formation or 3000 meters within 4 years
- Commitments completed by drilling the first exploration well 7220/10-1 (Salina), 13.08.2012-16.10.2012
- BoK 15.05.2022
- BoV 15.05.2024
- PDO 15.05.2025

Work commitments PL533B:

- As for PL533

Summary exploration wells in PL533 and PL533B

- Salina 7220/10-1, Gas discovery, Cretaceous and Jurassic.
- Filicudi 7219/12-1 / 7219/12-1A, Oil and gas discovery, Jurassic and Triassic.
- Hufsa 7219/12-2 S / 7219/12-2 A, Gas discovery and dry, Jurassic.
- Hurri 7219/12-3 S, Shows, Jurassic.
- Bask 7219/11-1, Shows, Tertiary.

Extensions and area relinquishments:

- Initial phase: 15.05.2009 - 15.05.2014.
- Following drilling of exploration wells, license initial phase extension approved in May 2014, May 2015 and November 2017.
- Partial relinquishment 15.05.2019. Retained area 219 km^2.

- Partial relinquishment 01.01.2021. Retained area 102 km^2.
- Partial relinquishment 01.01.2022. Retained area 30 km^2.
- Decision to relinquish the remaining licence area was unanimously approved in December 2022, and the area was fully relinquished as of 31.12.2022.

Overview of meetings held:

- 2009: One ECMC meeting, one EC work meeting.
- 2010: One ECMC meeting, one MC and one EC meeting.
- 2011: One ECMC meeting.
- 2012: One ECMC meeting, two EC work meetings.
- 2013: One ECMC meeting, one EC meeting, two technical work meetings.
- 2014: One ECMC meeting, one MC meeting, three technical work meetings.
- 2015: Two MC meetings, one EC technical workshop.
- 2016: One ECMC meeting, one EC meeting.
- 2017: Two ECMC meetings, one ECMC TopSeis processing meeting, one EC pre-spud meeting.
- 2018: One ECMC meeting, 5 EC TopSeis processing work meetings.
- 2019: Three processing work meetings, one ECMC meeting, 4 EC and technical meetings on Bask.
- 2020: One ECMC meeting, two EC and ECMC meetings on planning of Bask drilling, one ECMC on relinquishment of eastern part of PL 533.
- 2021: One ECMC meeting.

Reasoning for relinquishment of the licenses:

Five wells were drilled in PL533/PL533B during the period 2012 to 2021, resulting in three uneconomical discoveries. No further prospectivity has been identified in the licences and the relinquishment was effective as of 31.12.2022.

2 Database

The well and seismic database at license award is summarized in Table 2.4 and Table 2.1. In line with the license obligations, 3D seismic (WG0901) was purchased in 2011, covering the majority of the PL533 area. Prospect evaluation and maturation was mainly conducted on the 3D. In addition, the license acquired new 3D seismic in 2017, utilising new technology with TopSeis data (LN17001).

2.1 Seismic data

In the application phase and at award, the PL533 license was only covered with sparse vintage 2D data, as illustrated in Fig. 2.1 and summarized in Table 2.1. Key 2D lines were reprocessed, listed in Table 2.2. As part of licence agreement, 3D data was acquired and added into the common seismic database. A subset of the WG0901 regional seismic survey (NPDID 7057) served as the seismic database evaluating the PL 533 license as well as planning of several exploration wells as summarized in section 4 Discovery status and prospect update. Offset cubes and velocity field seismic cubes are included and a set of tailor-made cubes have been generated in-house. Main cubes applied in prospect- and discovery evaluation were the standard full fold, near, mid and far offset cubes, inverted AI and Vp/Vs cubes. Outline of the WG0901 subset relative to the PL533 is given in Fig. 2.2.

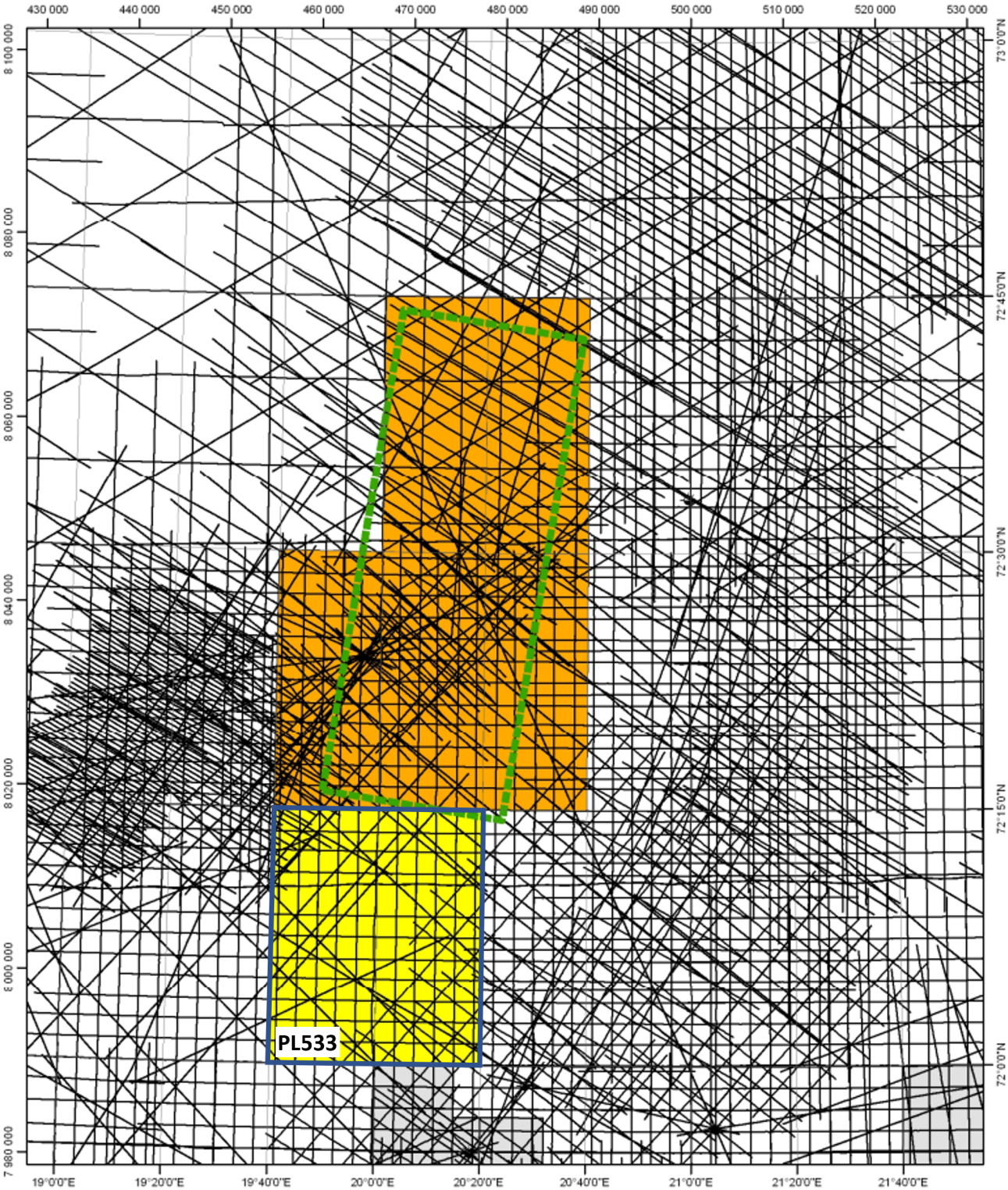


Fig. 2.1 Sparse 2D data at license award.

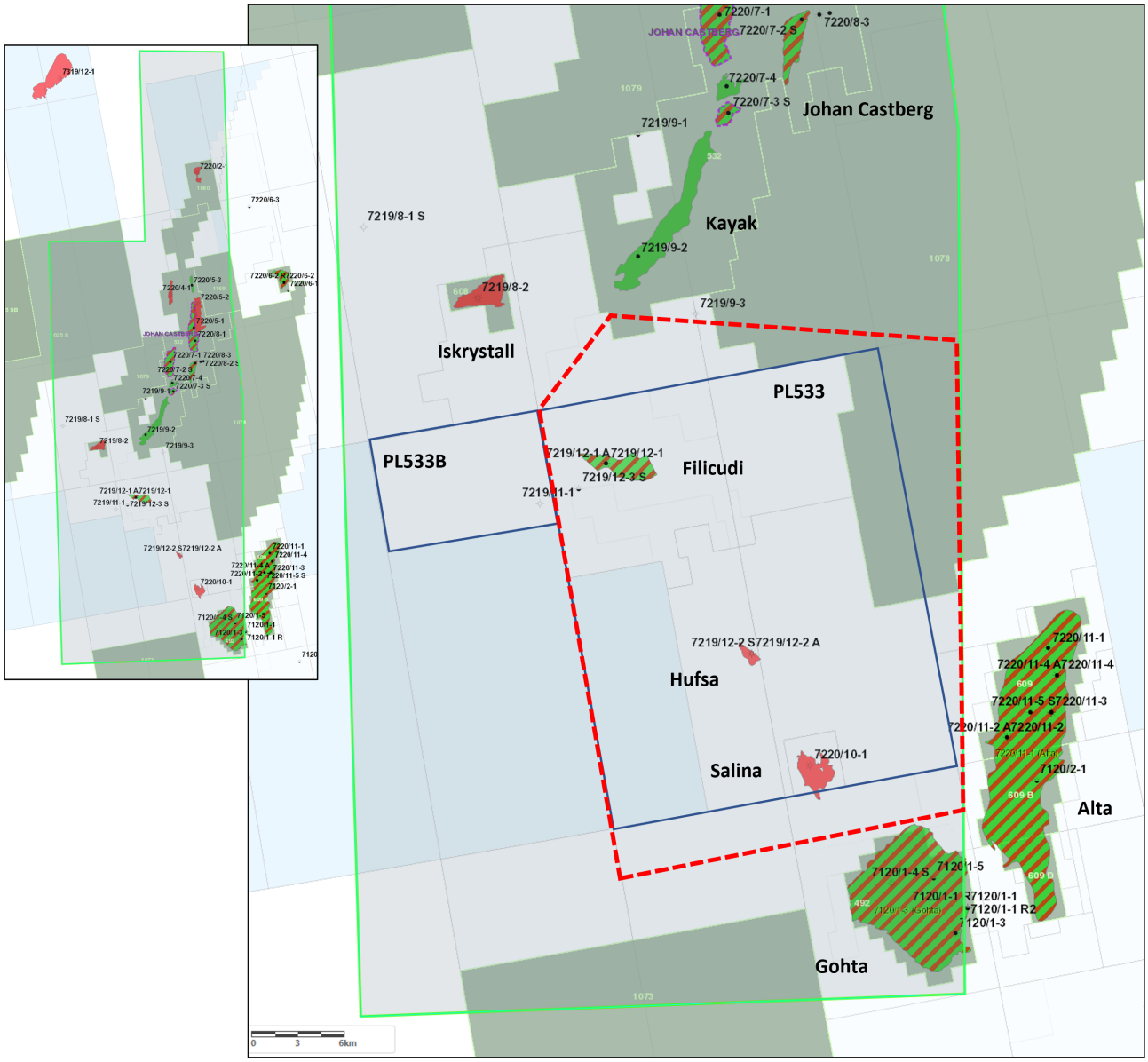


Fig. 2.2 Outline of 3D WG0901 survey included in the common seismic database *Total area was 940 sq km. Exploration wells and discoveries made in the license and surrounding areas following award are shown.*

Table 2.1 PL533 common seismic database at award - Public data

Survey	# Lines in PL533	Operator	Year	NPDID
F-86	8	Fina	1986	2826
LHSG-89	7	Statoil	1989	3229
MN85-2	3	Mobil	1985	2734
NH8306	24	Norsk Hydro	1983	2566
NH8403	17	Norsk Hydro	1984	2625
NH8412	8	Norsk Hydro	1984	2633
NH9702	1	Norsk Hydro	1997	3860
NPD-BA02-76	1	NPD	1976	2179
NPD-BJSY-84	23	NPD	1984	2644
NPD-TR-73	3	NPD	1973	2078
NPD-TR-82	2	NPD	1982	2507
NPD-TR-83	3	NPD	1983	2572

SG8962	2	Saga Petroleum	1989	3271
SG9106	8	Saga Petroleum	1991	3430
SG9309	5	Saga Petroleum	1993	3517
SG9401	7	Saga Petroleum	1994	3680

Table 2.2 PL533 common seismic database at award - Non Public data

Survey	Line	Operator	Year	Reprocessed
BARE 05	D-5	Fugro	1973/1986	2005
BARE 06	7215	Fugro	1973/1986	2005
BARE 07	7210	Fugro	1973/1986	2005
BARE 08	2015-84	Fugro	1973/1986	2005
BARE 09	2015	Fugro	1973/1986	2005
BARE 10	2000	Fugro	1973/1986	2005

At a later stage in the license timespan of the PL533/PL533B, a 3D survey was acquired using new TopSeis technology (LN17001, NPDID 8477). The higher resolution seismic was utilised in the assessment of the discoveries made (Salina and Fillicudi), and in the planning and execution of new exploration wells (Hufsa and Bask) and in the assessment of further exploration potential. The outline of the LN17001 survey is illustrated in Fig. 2.3 and 3D data is summarized in Table 2.3 .

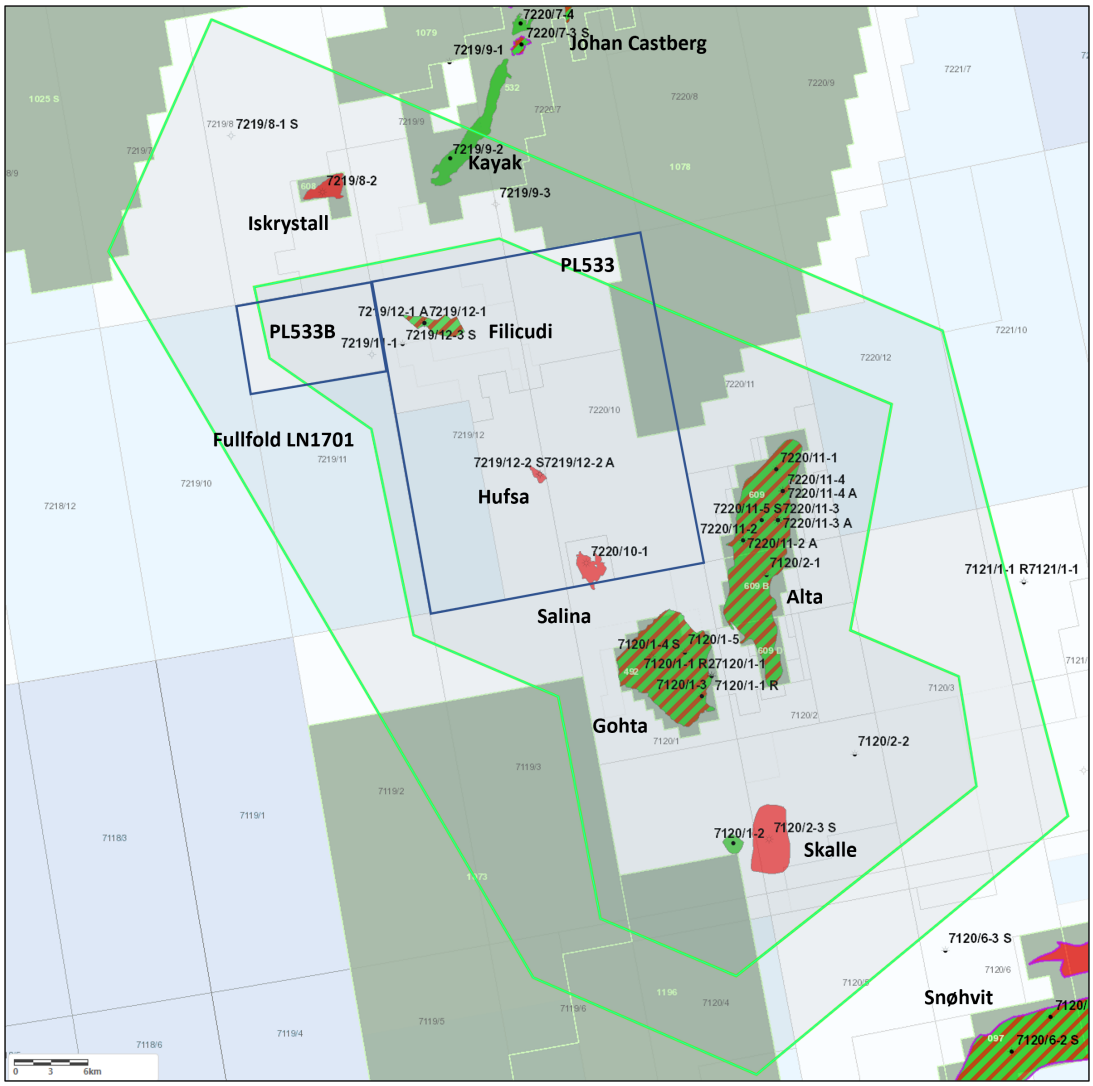


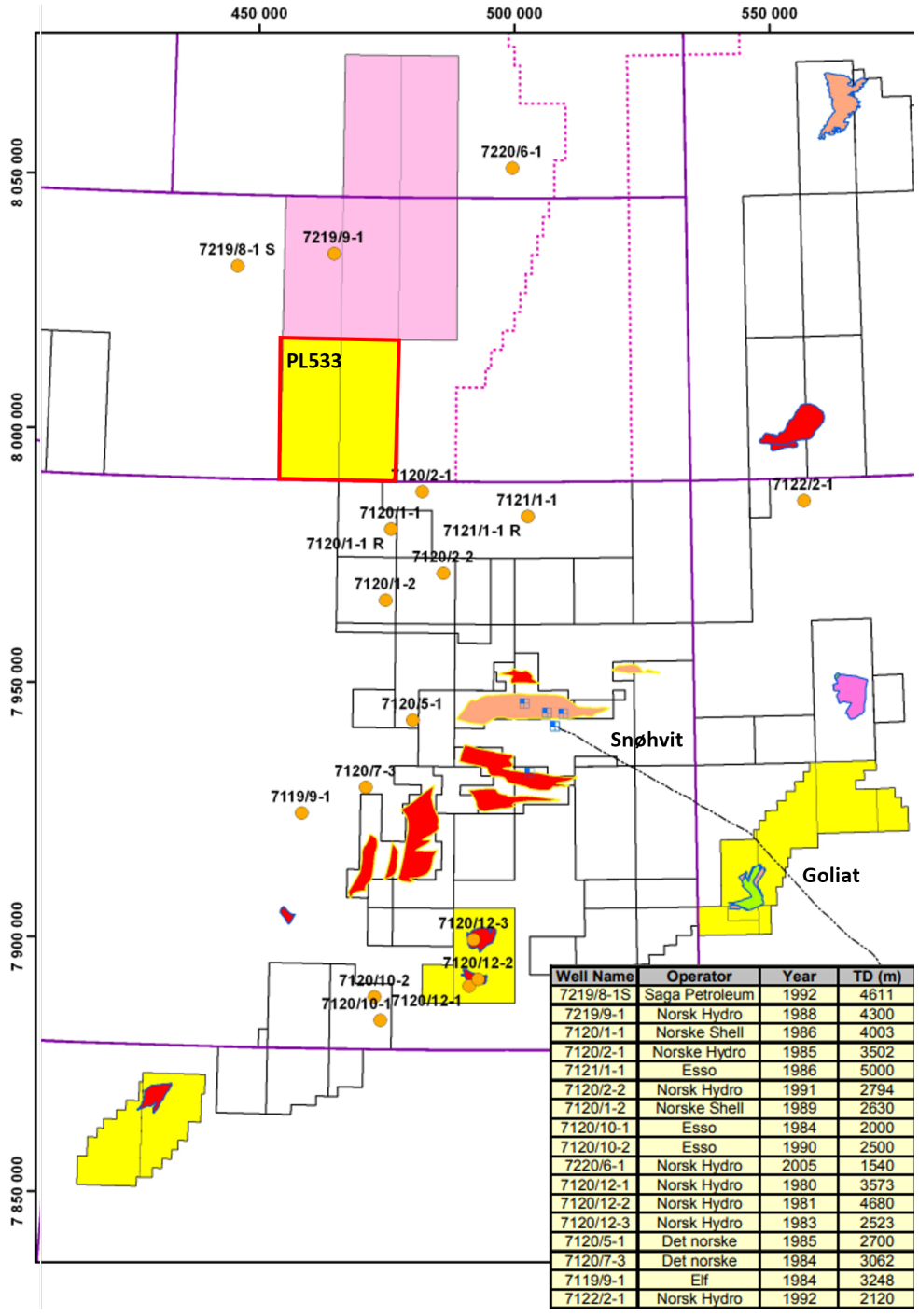
Fig. 2.3 Outline of 3D TopSeis (LN17001) *TopSeis data utilised in the PL533/533B assessments.*

Table 2.3 PL533 common 3D seismic database

Survey	Operator	Year	NPDID
WG0901	WesternGeco	2009	7057
LN17001	Lundin	2017	8477

2.2 Well data

The PL533 common well database at award is shown in Fig. 2.4 and listed in Table 2.4.



Well Name	Operator	Year	TD (m)
7219/8-1S	Saga Petroleum	1992	4611
7219/9-1	Norsk Hydro	1988	4300
7120/1-1	Norske Shell	1986	4003
7120/2-1	Norske Hydro	1985	3502
7121/1-1	Esso	1986	5000
7120/2-2	Norsk Hydro	1991	2794
7120/1-2	Norske Shell	1989	2630
7120/10-1	Esso	1984	2000
7120/10-2	Esso	1990	2500
7220/6-1	Norsk Hydro	2005	1540
7120/12-1	Norsk Hydro	1980	3573
7120/12-2	Norsk Hydro	1981	4680
7120/12-3	Norsk Hydro	1983	2523
7120/5-1	Det norske	1985	2700
7120/7-3	Det norske	1984	3062
7119/9-1	Elf	1984	3248
7122/2-1	Norsk Hydro	1992	2120

Fig. 2.4 PL533 common well database. *at award of license.*

Table 2.4 PL533 common well database at license award

Wellbore name	Compl. year	NPDID	TD Strat.	Content	HC comments	Drilling operator	TD (m)
7219/8-1S	1992	2031	Stø Fm	Dry	Weak shows in Knurr Fm.	Saga Petroleum	4611
7219/9-1	1988	1138	Snadd Fm.	shows	Strong oil shows in Knurr Fm, Realgrunnen Gp	Norsk Hydro	4300
7120/1-1	1986	484	Basement	shows	Oil shows in Perm	Norske Shell	4003
7120/2-1	1985	473	Basement	shows	Oil shows in Perm	Norsk Hydro	3502
7121/1-1	1986	896	Ørn Fm	Dry	Gas shows in Trias	Esso	5000
7120/2-2	1991	1690	Stø Fm	Shows	Oil shows in Knurr Fm	Norsk Hydro	2794
7120/1-2	1989	1366	Fruholmen Fm.	Oil	Oil in Knurr Fm. and Hekkingen Fm.	Norske Shell	2630
7120/10-1	1984	274	Fruholmen Fm.	Dry		Esso	2000
7120/10-2	1990	1561	Hekkingen Fm.	Dry		Esso	2500
7220/6-1	2005	456	Basement	Dry	Oil shows in Paleozoic	Norsk Hydro	1540
7120/12-1	1980	123	Kobbe Fm	Dry	Shows in Early Cretaceous amd Kobbe Fm	Norsk Hydro	3573
7120/12-2	1981	122	Basement	Gas	Gas in Realgrunnen Gp and Snadd Fm.	Norsk Hydro	4680
7120/12-3	1983	8	Fruholmen Fm	Gas	Gas in Realgrunnen Gp	Norsk Hydro	2523
7120/5-1	1985	471	Fruholmen Fm	shows	Oil shows in Stø-, and Nordmela Fm	Statoil	2700
7120/7-3	1984	104	Nordmela Fm	Shows	Shows in Stø Fm.	Statoil	3062
7119/9-1	1984	132	Fruholmen Fm.	Dry	Shows in Realgrunnen Gp.	Elf	3248
7122/2-1	1992	2018	Stø Fm.	Dry		Norsk Hydro	2120

3 Geological and geophysical studies

The initial licence work program focus was to perform a detailed evaluation of the Jurassic, Triassic, Cretaceous and Paleocene play models in order to establish an exploration strategy that encompass the total licence resource potential. The PL533 geophysical and geological studies work can be split in the following phases:

1. Prospect evaluation and maturation; a complete remapping of the licence area on basis of the 3D WG0901 survey, with integration of results from geological and geophysical analysis and studies (see below). Served as basis for the decision to test various prospects.
2. 7220/10-1 Salina well planning and operations.
3. Salina discovery evaluation.
4. Evaluation of the remaining prospectivity of PL533/533B.
5. Planning and execution of a drilling campaign to test several plays identified in licence.

Main studies and assessments over the licence period can be summed up as follows:

- AVO including frequency blending projects
- Seismic reprocessing of several surveys
- Reservoir studies and model building for heavy oil in the Barents Sea.
- Basin modeling studies/fluid composition evaluation
- High resolution TopSeis acquisition
- 3D site survey
- In depth core descriptions/correlation
- Field work for analogue areas.

An uplift in the seismic imaging in the course of the licence period is illustrated in Fig. 3.1 and Fig. 3.2. New data have been utilised in licence decision, from drilling exploration wells, licence extension application, to partly relinquishment and final relinquishment.

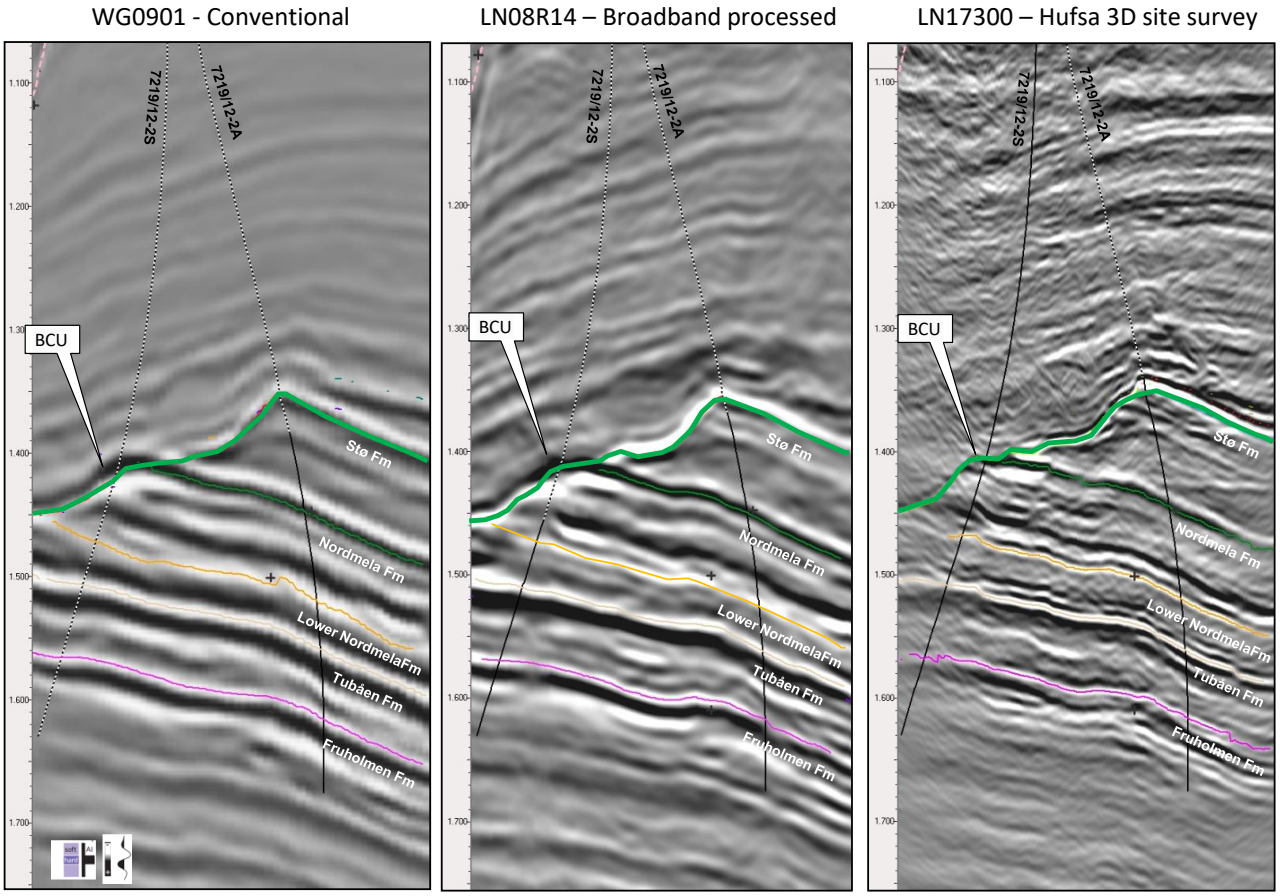


Fig. 3.1 Seismic improvement *Imaging improvement in the planning phase of the 7219/12-2 Hufsa well. A clear resolution up-lift can be seen.*

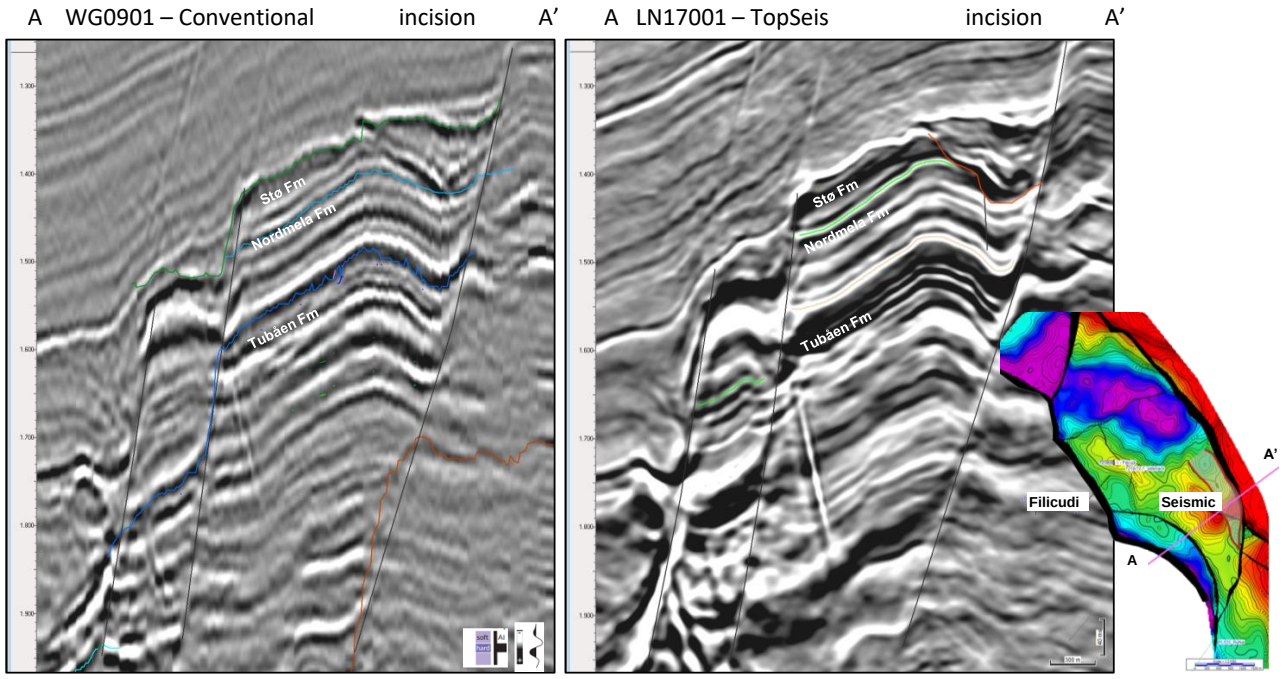


Fig. 3.2 Seismic improvement 2 *Up-lift in imaging from conventional seismic to TopSeis, post Filicudi well 7219/12-1. Better definition of incision geometry, vertical resolution and overall structural setting can be seen at the southern part of the Filicudi structure.*

4 Discovery status and prospect update

A prospect and lead overview is shown in Fig. 4.1. Minor discoveries were made in the Salina, Filicudi and Hufsa wells. The Hurri and Bask wells were dry with shows. Post Bask well, all remaining prospectivity was downgraded to leads. Main risk elements are regarded to be reservoir quality and trap integrity. All discoveries made are within three-way closures, hence lack of sealing faults is regarded as the critical risk element.

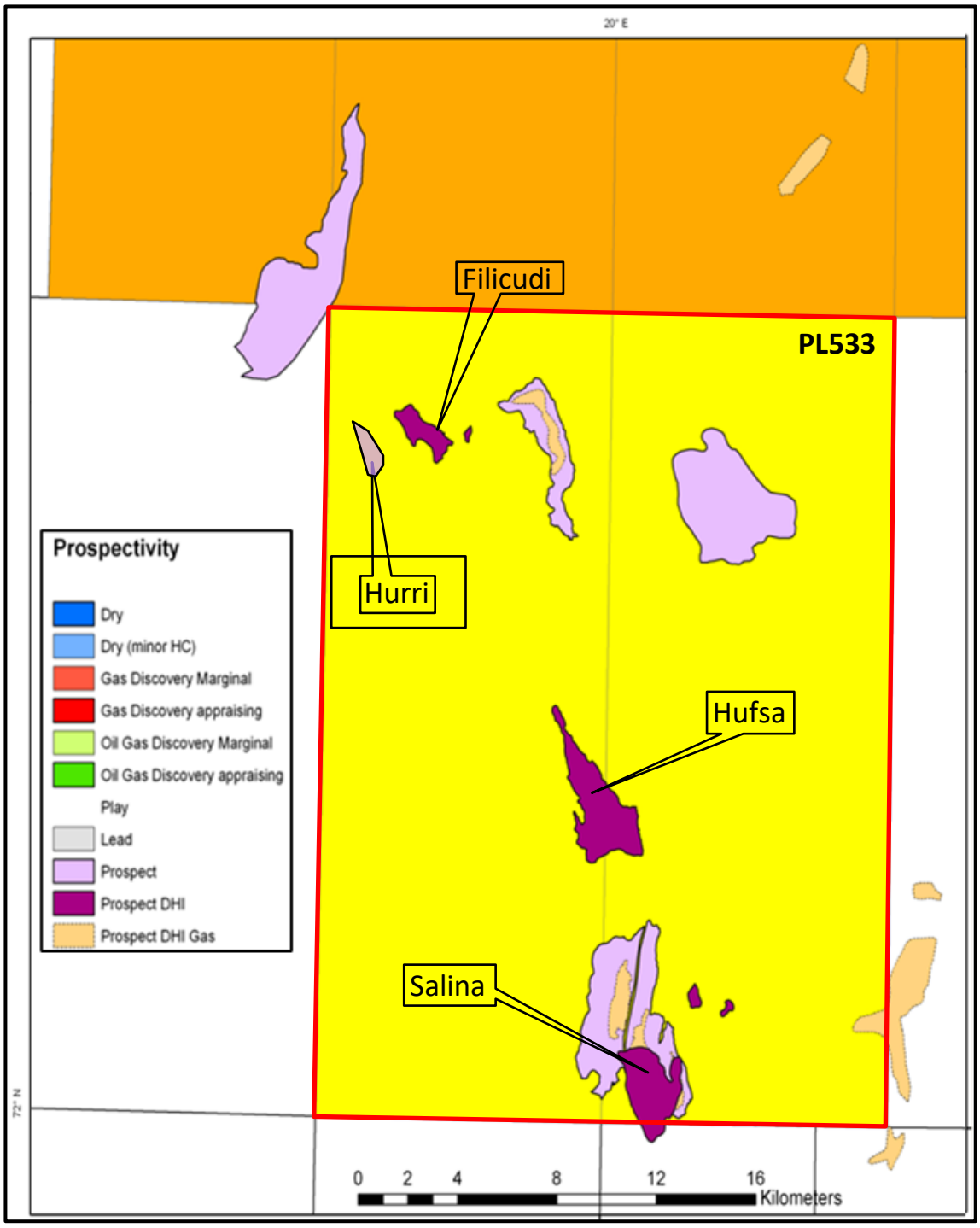


Fig. 4.1 Overview prospects and lead PL533/533B *at 20th License award.*

4.1 Well 7220/10-1 Salina

Well 7220/10-1 was drilled on the Salina prospect in 2012. The primary exploration target was to prove petroleum in Early Cretaceous to Late Jurassic reservoir rocks (Knurr and Hekkingen formations). The secondary target was to prove petroleum in Middle to Early Jurassic reservoir rocks (Stø, Nordmela, Tubåen and Fruholmen formations). The drilling of the 7220/10-1 well on the Salina prospect resulted in a small gas discovery in the Cretaceous Kolmule formation and Jurassic Stø formation.

- The well proved the presence of reservoir consisting of sandstones and siltstones of Aptian age within the Kolmule Formation. Top of this sandstone was at 1291 m and the upper 36 m was gas bearing and had 20% average porosity and a net/gross of 96%.
- Top Stø Formation was penetrated at 1513.5 m. It consisted of 132 m sandstone with very good reservoir quality. The upper 53 m was gas bearing and had average porosity of 20% and a net/gross of 90%. A clean gas-water contact was found at 1567 m.
- Sandstone reservoirs were also found in Nordmela, Tubåen, Fruholmen and Snadd Formations with average porosity ranging from 17 to 21%. All reservoir levels below the Stø Formation was water bearing. No oil shows were described in the well.

An overview of the discovery is given in Fig. 4.2 and Fig. 4.3. Summary of the resource potential for the Salina discovery is listed in Table 5.1.

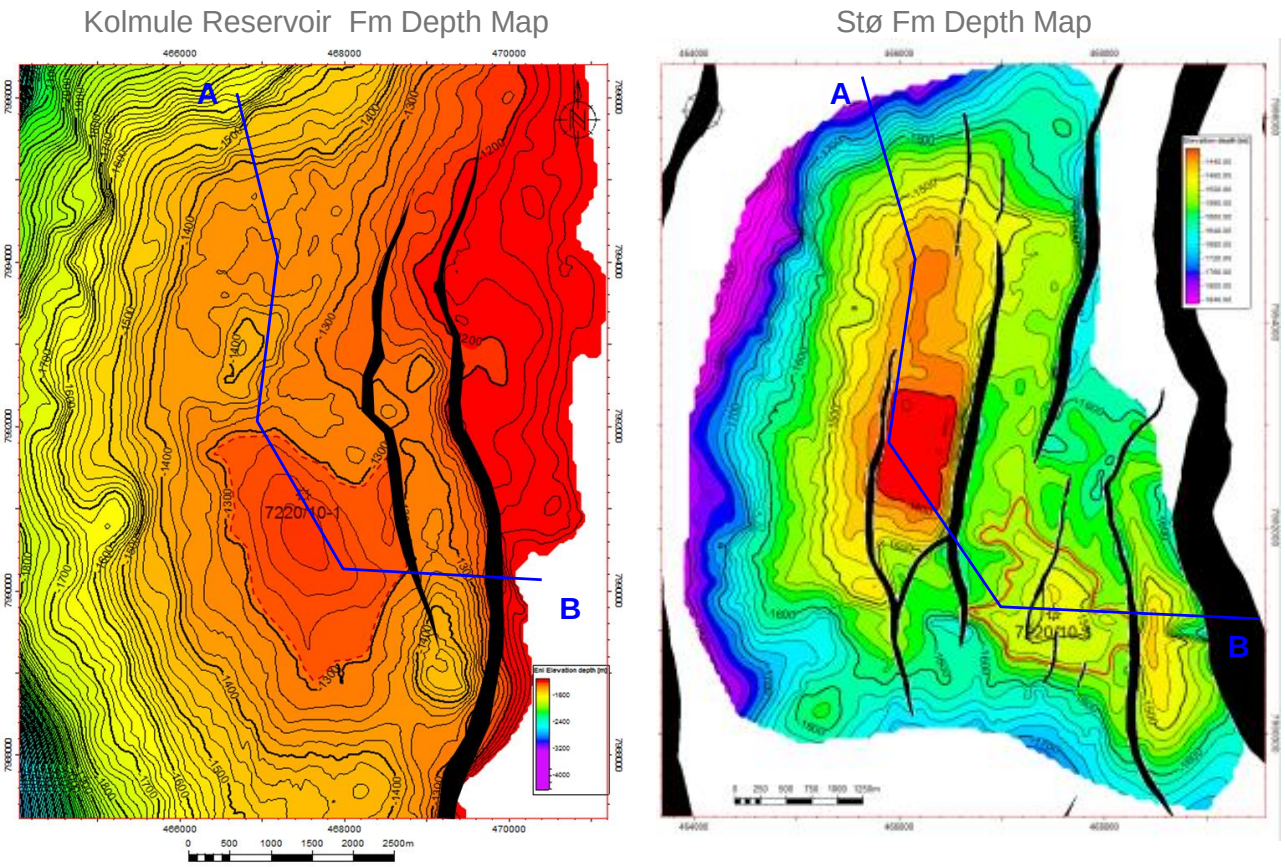


Fig. 4.2 Salina discovery *depth maps of reservoir levels at Kolmule and Stø formations. A clear GWC was encountered at both levels. Section is shown in Fig. 4.3.*

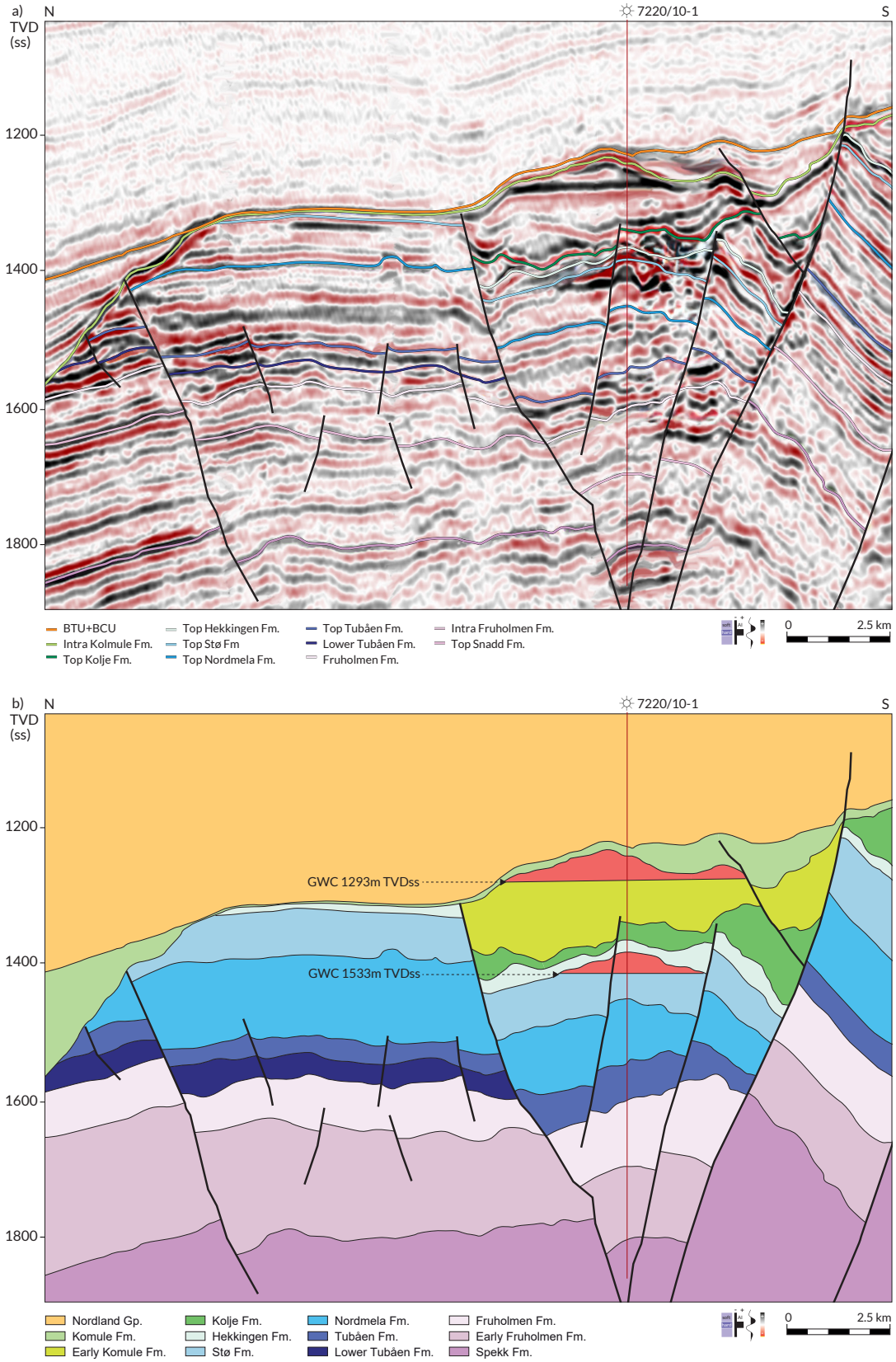


Fig. 4.3 Overview Salina *Small four-way closures encountered at two levels. Location of cross-section in Fig. 4.2.*

4.2 Well 7219/12-1 Filicudi

Well 7219/12-1 was drilled on the Filicudi prospect. The primary objective was to test the hydrocarbon potential in the Late Triassic – Early Jurassic Tubåen and Fruholmen formations. Secondary objective was to test the hydrocarbon potential in the Triassic Snadd Formation.

- The well encountered top Tubåen Formation primary target with excellent reservoir properties in Rhaetian age sandstone. The Tubåen sandstone was gas and oil bearing. Oil shows, fluorescence and cut, were described on cores down to 1660 m.
- Weak shows were recorded on two sidewall cores at 1694.7 and 2320 m, and on two cuttings samples at 1687 m and 2176 m

The objective of the sidetrack well 7219/12-1 A was to test the hydrocarbon potential and reservoir properties of the Early Jurassic Nordmela Formation and the Upper Triassic Tubåen Formation in the fault block to the East of the main Filicudi prospect.

- Communication and similar hydrocarbon types and contacts as in the main wellbore was confirmed.
- Top target reservoir, Early Jurassic Nordmela Formation sandstone, was encountered at 1699 m (1516.3 m TVD), overlying Late Triassic to Early Jurassic sandstone of the Tubåen Formation. The sandstones were gas and oil bearing.
- Two gas gradients were seen, the upper interval, above ca 1735 m is 2 bar less than the lower interval. The oil is heavy, with stock tank density 0.956 to 0.959 g/cm3.
- Weak shows were seen in two SWCs in claystones at 1682 m and 1688.4 m above the reservoir. Below the reservoir cuttings had shows down to 1871 m (direct and cut fluorescence), while SWC's had oil shows down to 1910 m. The SWC shows down to 1850 were described as weak hydrocarbon odour
- Testing equipment on the rig was not capable of handling the heavy oil found in the well. Therefore, no DST was carried out.

An overview of the Filicudi prospect is given in Fig. 4.4 and Fig. 4.5 and a summary of the resource potential for the Filicudi discovery is listed in Table 5.1.

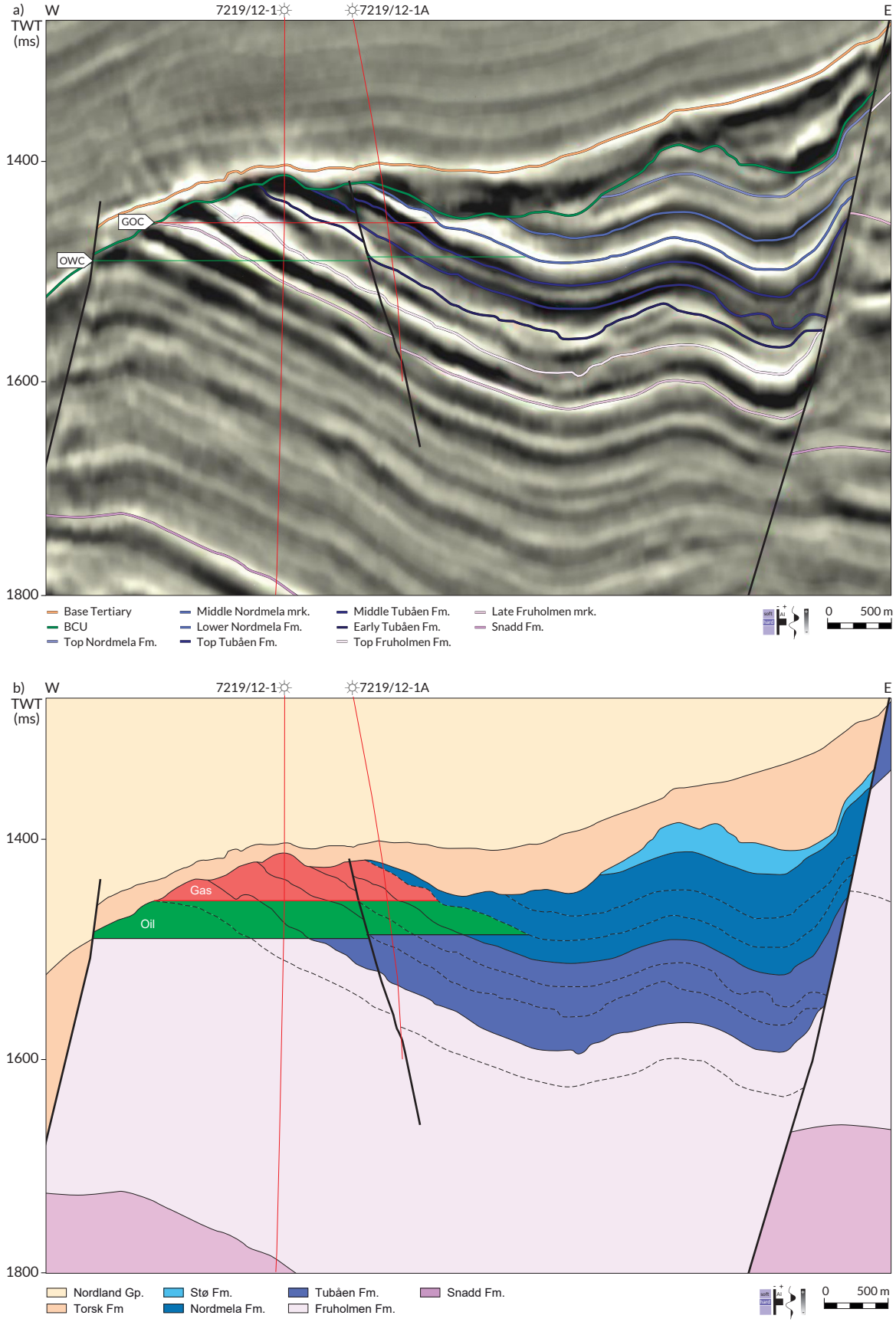


Fig. 4.4 Filicudi *The Filicudi exploration well 7219/12-1 and sidetrack 7219/12-1 A. Location of the section is shown in Fig. 4.4.*

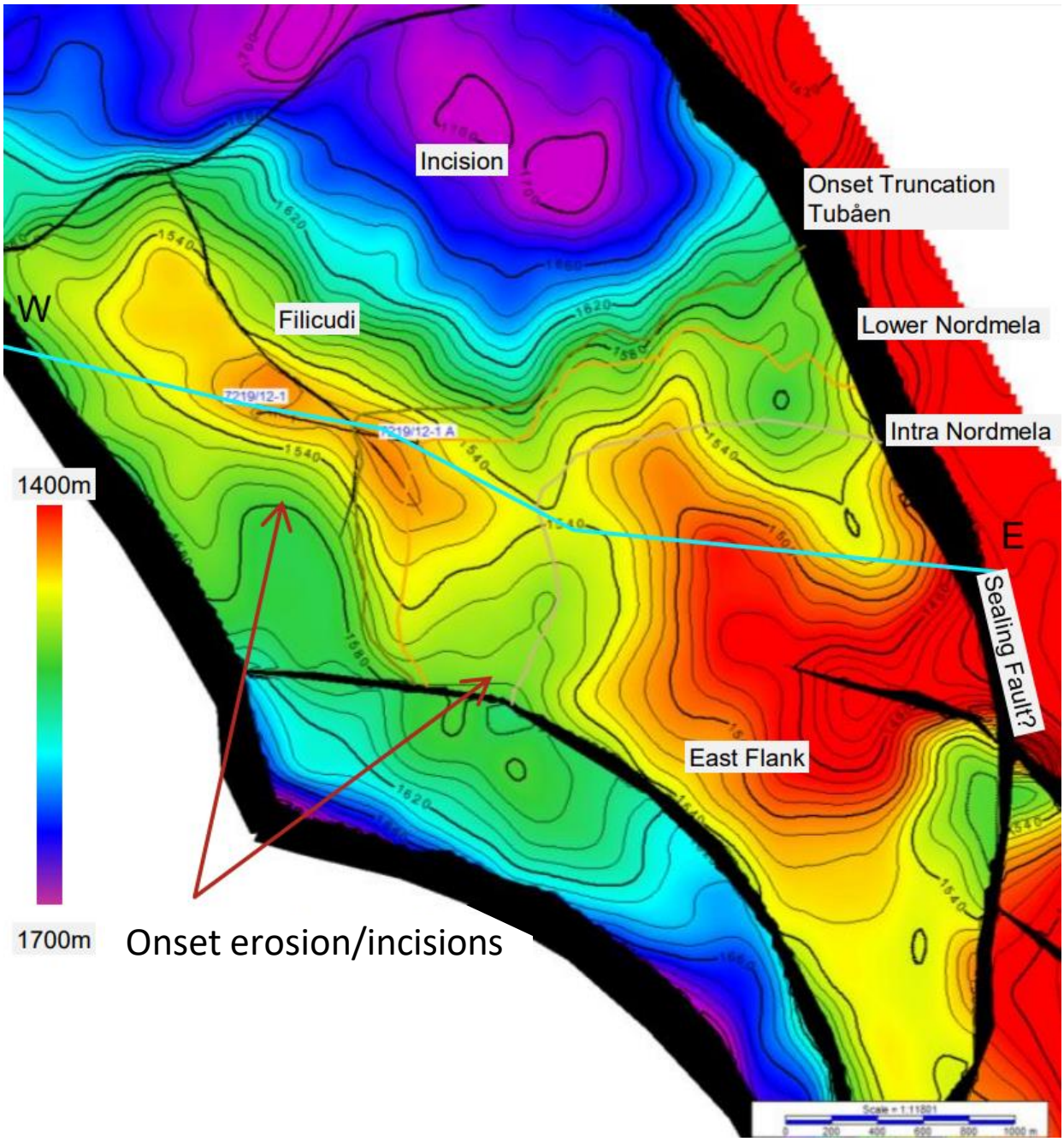


Fig. 4.5 Filicudi structure map *Depth map of top reservoir level at Filicudi, with location of exploration well 7219/12-1 and sidetrack 7219/12-1 A. Seismic section and corresponding geosection in Fig. 4.4.*

4.3 Well 7219/12-2 S/A Hufsa

Well 7219/12-2 was design as a Y-well with two branches; 7219/12-2 S and 7219/12-2 A to test the Hufsa prospect. Primary exploration target for 7219/12-2 S was to prove petroleum in Late Triassic/Early Jurassic reservoir rocks in the Tubåen formation. The secondary exploration target was to prove petroleum in Middle Jurassic reservoir rocks in the Stø formation with the 7219/12-2 A. In addition, a small DHI in the Early Nordmela formation was tested.

- Top Tubåen Formation came in at 1843 m (1678 m TVD) with good reservoir quality, water wet.
- Top Nordmela Formation came in at 1553 m (1480.4 m TVD), with a gas column of 23 m of which about 20 m in sandstone with good to moderate reservoir quality. A well-defined gas-water contact was established at 1587.5 m (1503.5 m TVD).

- The Stø Formation was penetrated from 1618 m (1413 m TVD) to top Nordmela Formation at 1813 m (1563 m TVD).
- The Stø Formation had good reservoir quality, but proved water-bearing.
- Two good pressure points acquired on MDT, one in Stø and one in Nordmela, same water gradient as below the GWC in Nordmela in well 7219/12-2 S.

An overview of Hufsa prospect is given in Fig. 4.6 and Fig. 4.7. The well was permanently abandoned on 7 November 2017 as a small gas discovery.

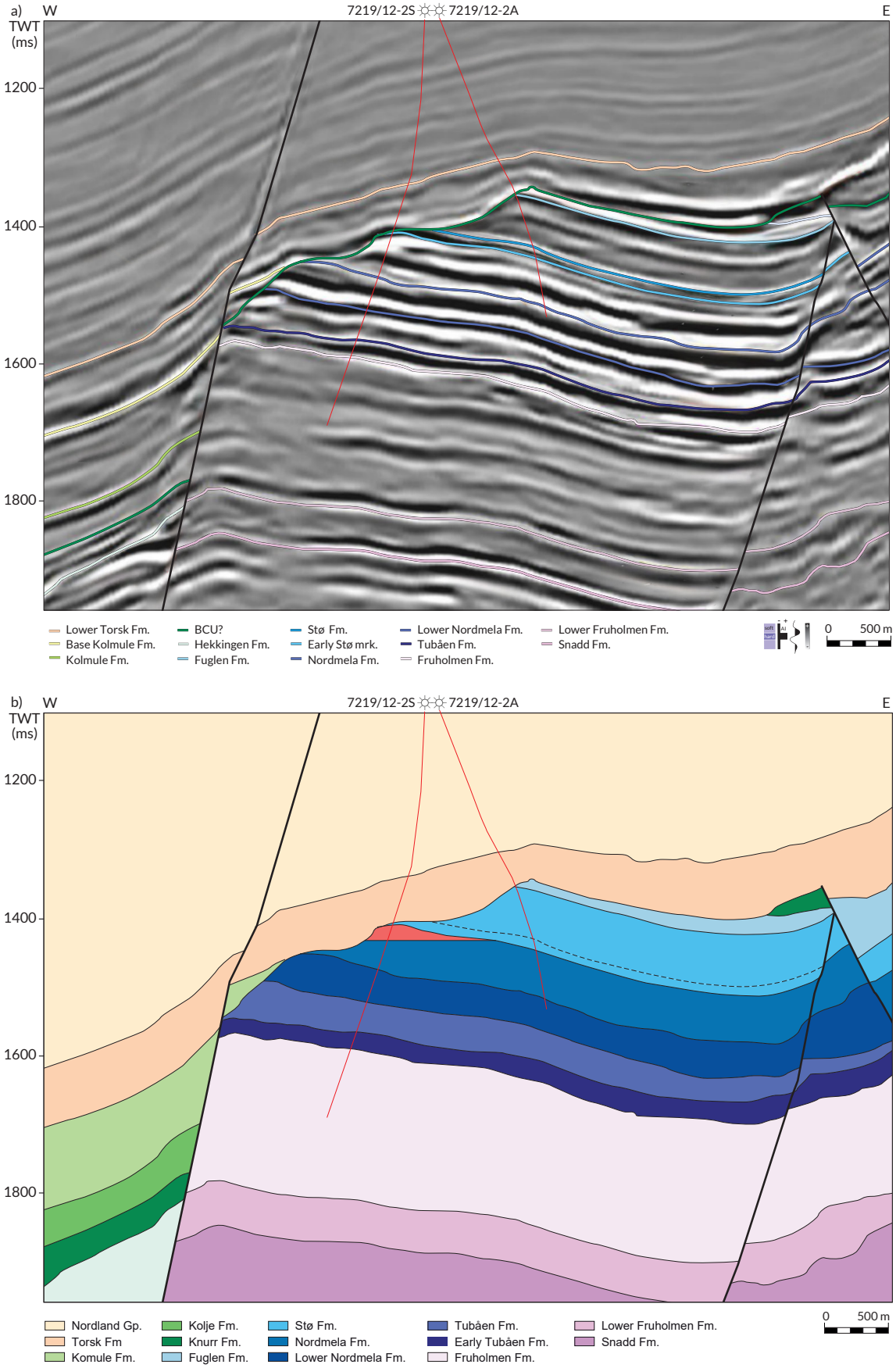


Fig. 4.6 Hufsa *seismic line and cross section.*

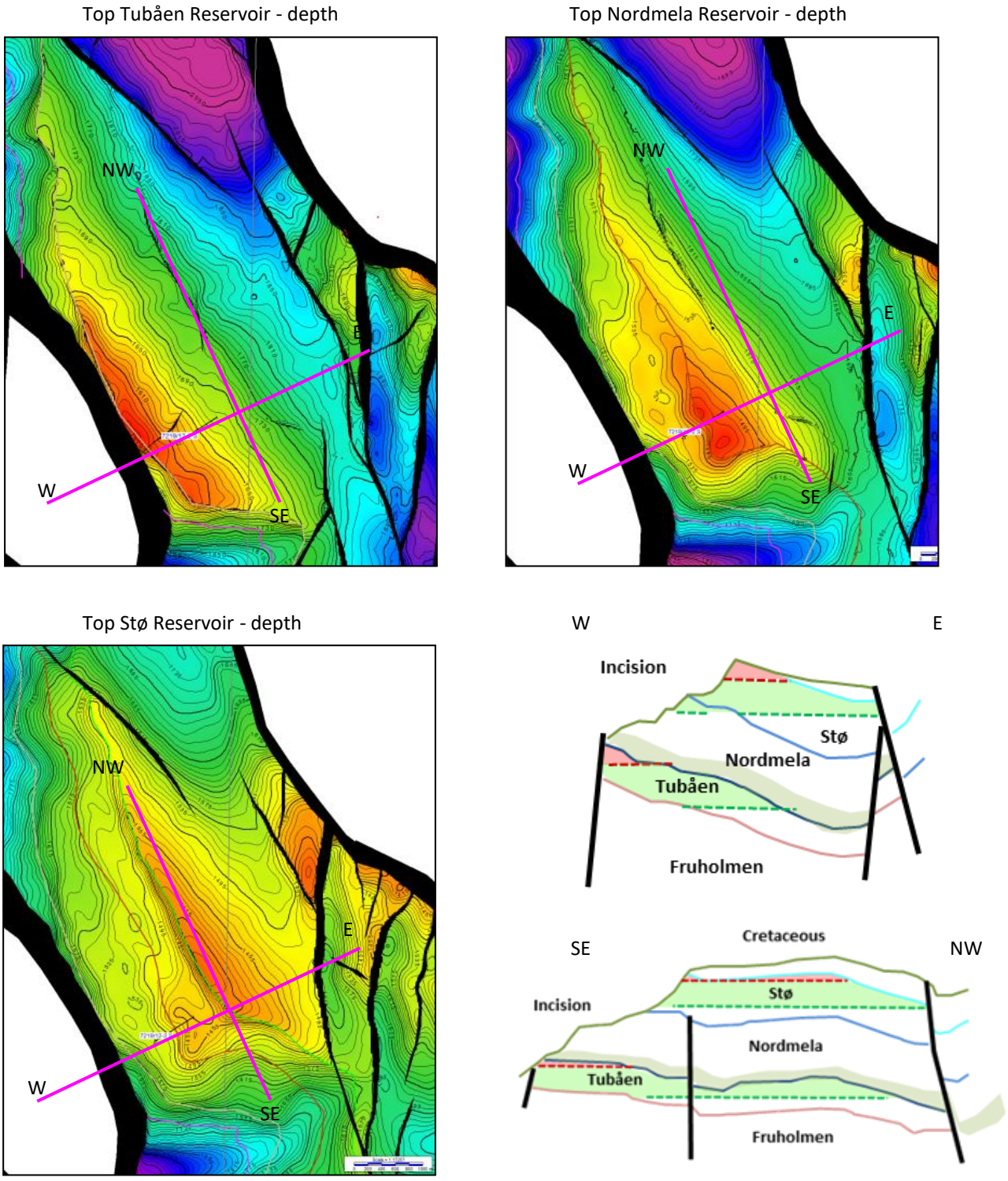


Fig. 4.7 Hufsa prospect *Hufsa was designed to test three different levels within the Realgrunnen Gp, Depth map of target is illustrated with Top Tubåen Fm, Top Nordmela Fm, and secondary target Stø Fm. Conceptual model pre-drill is indicated. Seismic section and geosection is illustrated in Fig. 4.6.*

4.4 Well 7219/12-3S Hurri

Well 7219/12-3 S was drilled to test the Hurri prospect. The primary objectives were to test the reservoir properties and hydrocarbon potential at Hekkingen Formation/BCU level, and in the Stø Formation, with secondary objectives in the Kolje Fm and Nordmela Fm. The well results can be summarized as :

- Top Hekkingen Formation was encountered at 2169 m (2127 m TVD) with reservoir development.
- The Stø Formation was encountered at 2243 m (2201 m TVD) with 100 m water-bearing sandstone of moderate to good reservoir quality.
- The Nordmela Formation was encountered at 2348 m (2306 m TVD) with a total of 90 m water-bearing sandstone layers of moderate quality.
- The Tubåen Formation was encountered at 2578 m (2535 m TVD) with 40 m water-bearing sandstone of moderate quality.
- In the Kolje formation, the well encountered a 67 m thick water-bearing sandstone with poor reservoir quality.

An overview of the Hurri prospect is given in Fig. 4.8 and Fig. 4.9. The well was permanently abandoned on 17 January 2018 as a dry well with shows.

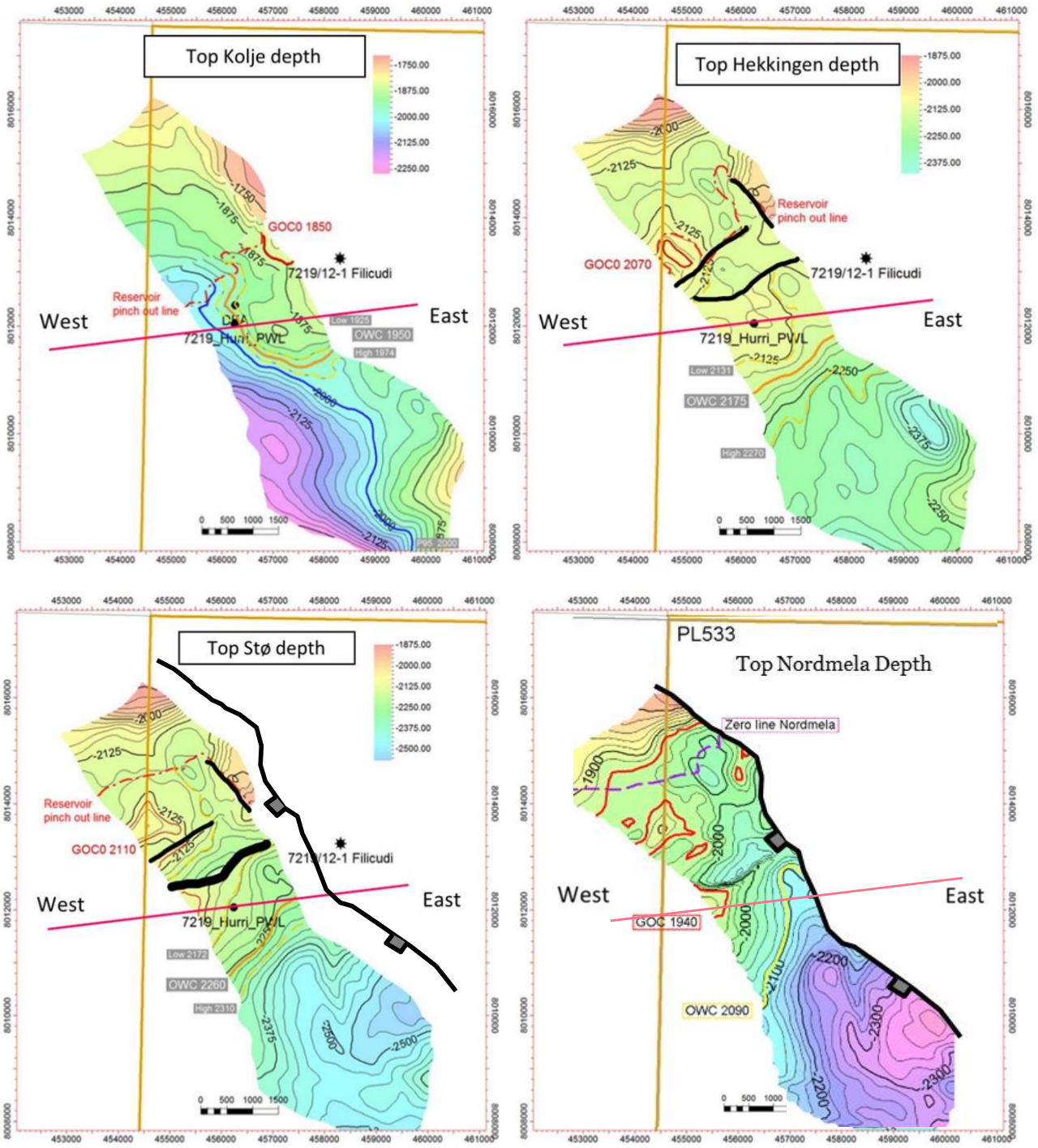


Fig. 4.8 Hurri prospect targets *The Hurri structure is a well-defined rotated fault block, downfaulted from the Filicudi structure. Potential at four different levels was identified, all depending on a sealing fault. Pre-drill prediction is illustrated at each level. Seimsic section and geosection is given in Fig. 4.9.*

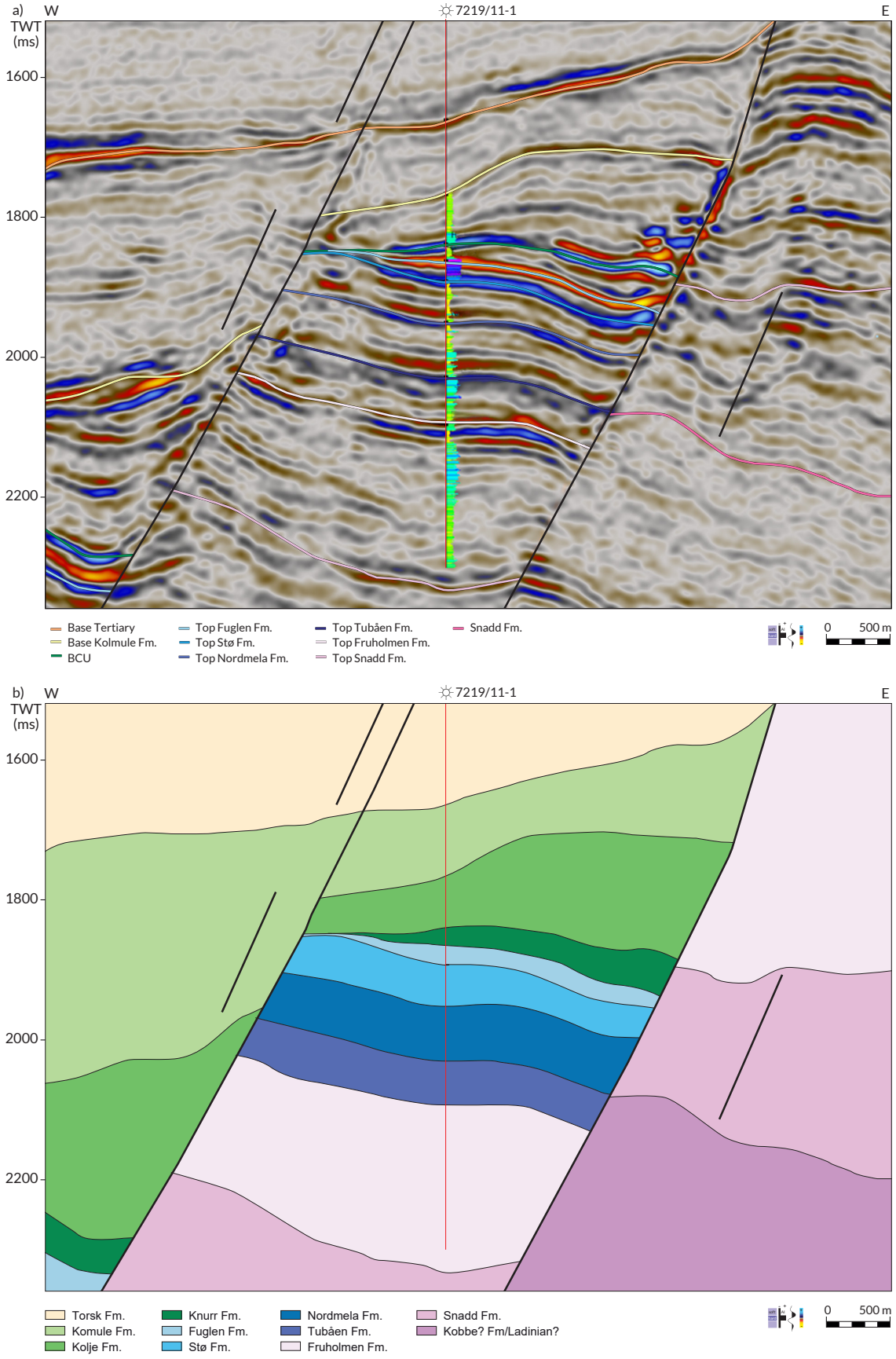


Fig. 4.9 Hurri seismic section *and geosection with Hurri main reservoir level target. Location section is given in Fig. 4.8.*

4.5 Well 7219/11-1 Bask

Well 7219/11-1 was drilled to evaluate the Bask prospect. The primary objective was to evaluate the reservoir properties and hydrocarbon potential of the Early Paleocene.

- The well encountered two stacked sandstone units.
- Both sandstones had poor reservoir quality.
- The upper Paleocene unit from 1880.5 to 1930 m corresponds to the Bask prospect.
- Weak oil shows in the form of very slow dull yellowish cut fluorescence and weak dull yellowish fluorescent residue were recorded in the upper Paleocene unit.

An overview of the Bask prospect is given in Fig. 4.10 and Fig. 4.11. The well was permanently abandoned on 4 February 2021 as a dry well with weak shows.

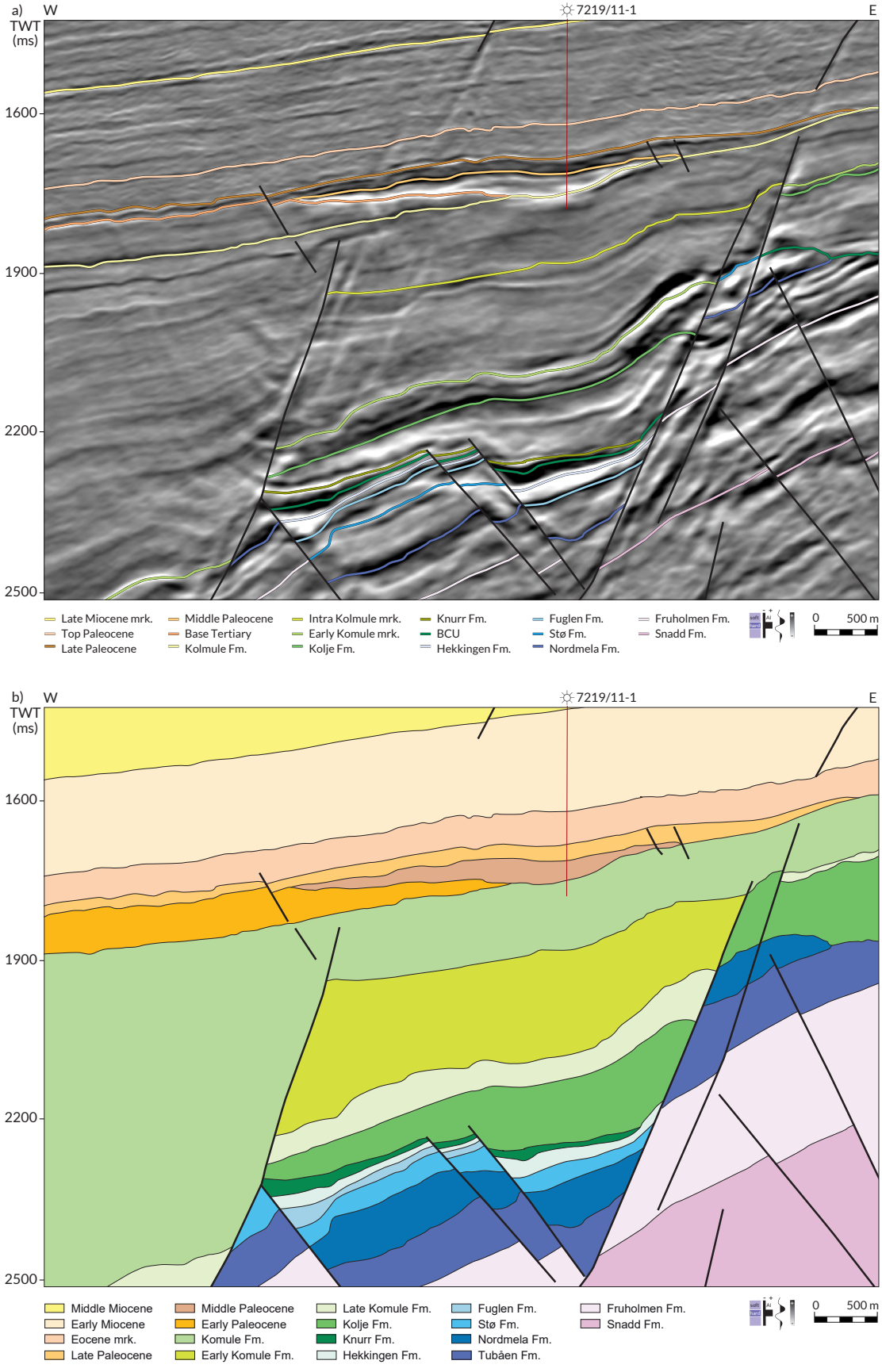


Fig. 4.10 Bask prospect *Bask prospect defined as an Early Tertiary pinchout trap, well-defined on seismic data. Location given in Fig. 4.11.*

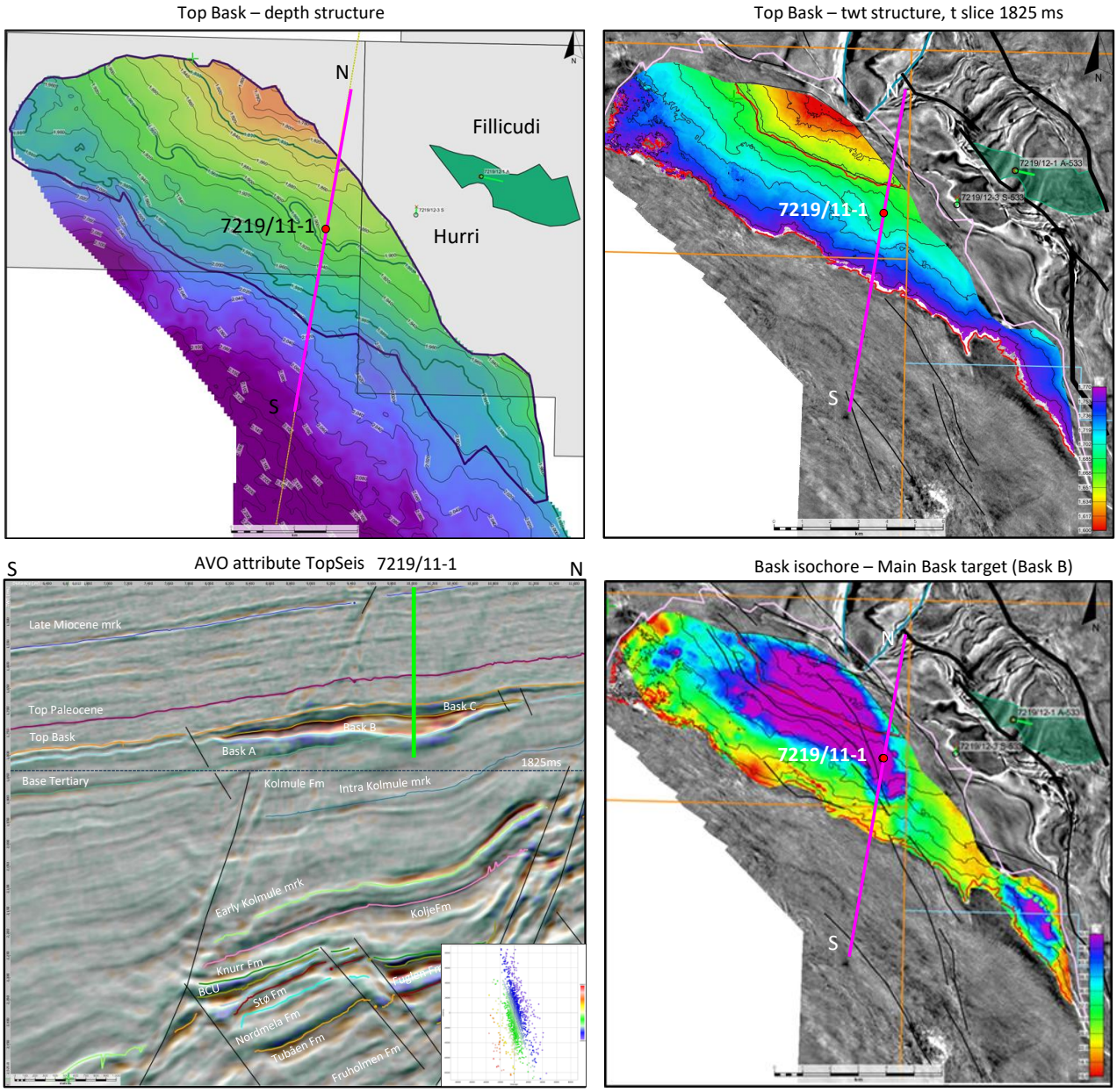


Fig. 4.11 Bask prospect and well location *Overview of the Bask prospect and placement of the exploration well 7219/11-1. Bask is defined as a stratigraphic pinchout of the early Paleocene, well-defined on AVO attribute (intercept/gradien).*

5 Technical evaluation

Three uncommercial discoveries were made in PL533; Salina, Filicudi and Hufsa. No technical-economical analysis has been carried out. An overview of the in-place volumes and P7 resource potential of discoveries made is listed in Table 5.1.

Table 5.1 In place volumes and P7 resource potential *for Salina and Filicudi.*

Prospect	Discovery well	Deposits	oil [million Sm^3]			Associated gas [billion Sm^3]			gas [billion Sm^3]		
In place			Low	Base	High	Low	Base	High	Low	Base	High
Salina	7220/10-1	sandstone							2.2	7.7	12.3
Filicudi	7219/12-1	sandstone	11.9	15.2	18,0	0.7	0.9	1.1	0.7	0.9	1,0
P7 recoverables											
Salina	7220/10-1	sandstone							1.6	3.4	6.2
Filicudi	7219/12-1	sandstone	2.1	3.1	4.4				0.4	0.5	0.7

6 Conclusion

Five exploration wells have been drilled in PL533 and PL533B, resulting in three uncommercial discoveries. No remaining drillable prospects have been identified, and the license decision was made to relinquish effective 31.12.2022.