April 2022

# PL937/PL937B Relinquishment Report

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# 1 HISTORY OF THE PRODUCTION LICENCE

Licenses PL937 and PL937B are located on the western margin of the Frøya High in the Norwegian Sea and comprise parts of blocks 6306/2, 6306/3 and 6406/12 (Fig. 1.1).

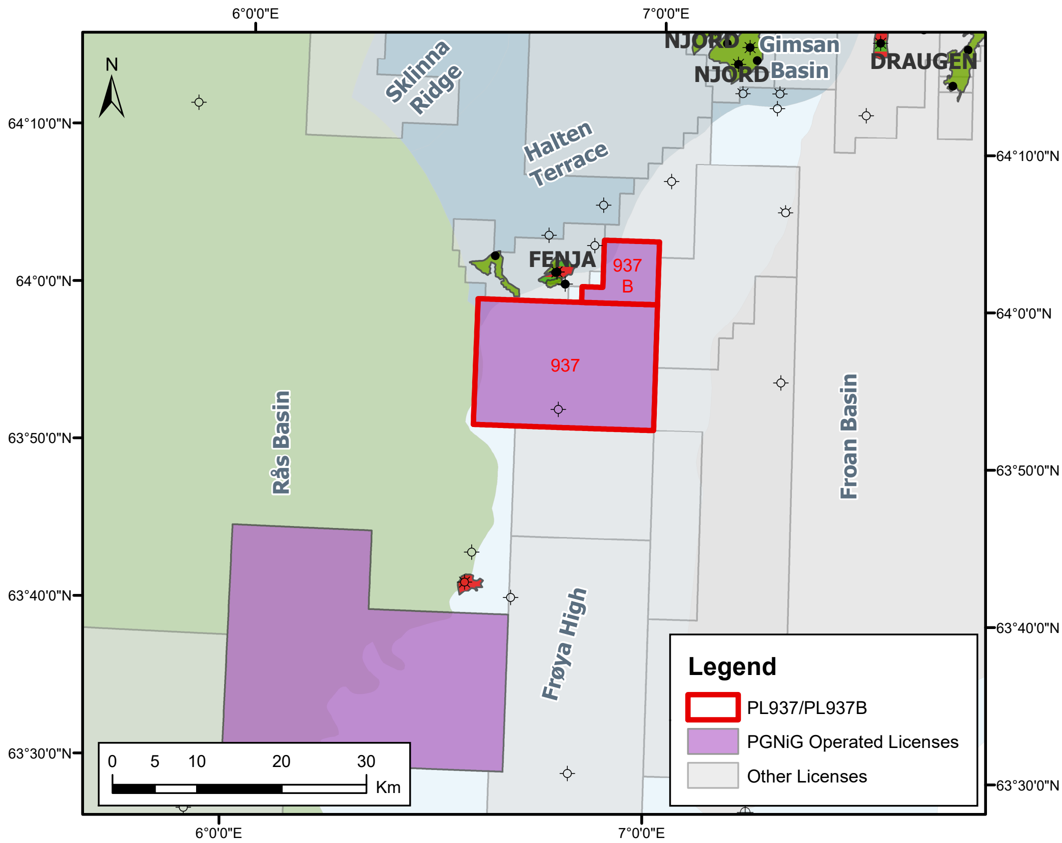


**Fig. 1.1 Location of license PL937/937B**

## Summary of Award and Participants

PL937 was awarded 2nd March 2018 as a result of the APA 2017 Round application and extension PL 937B was awarded 1st March 2019 as a result of the APA 2018 Round application. PGNiG Upstream Norway AS (then INEOS E&P Norge AS) was assigned as Operator with 40% share. DEA Norge AS and Petrolia NOCO AS were the other partners in the license with 30% share each. Leading up to the Drill or Drop (DoD) decision in early March 2020, the majority of the partnership, comprising DEA Norge AS (later Wintershall DEA Norge AS) and Petrolia NOCO AS, decided to drop the licence and PGNiG Upstream Norway AS excercised its right under Article 4.b of the licence terms and applied to the authorities for permission to drill an exploration well and become the sole shareholder (100% interest) of the license. An approval to drill an exploration well was granted by the authorities to PGNiG under the condition that at least one additional partner enterd the licence, and later in 2020 Lime Petroleum AS acquired a 15% interest in the licence from PGNiG and a formal drill decision was made by the licence. In 2021 Equinor Energy AS acquired a 20% interest from PGNiG Upstream Norway AS.

Table 1.1 summarises the license ownership history.

**Table 1.1 PL937/PL937B Licensee history**

| Date valid from | Date valid to | Company | Interest (%) |
|---|---|---|---|
| 31.12.2021 | 02.03.2022 | PGNiG Upstream Norway AS (Op.) | 65 |
| | | Lime Petroleum AS | 15 |
| | | Equinor Energy AS | 20 |
| 30.09.2021 | 31.12.2021 | PGNiG Upstream Norway AS (Op.) | 85 |
| | | Lime Petroleum AS | 15 |
| 29.05.2020 | 30.09.2021 | INEOS E&P Norge AS (Op.) | 85 |
| | | Lime Petroleum AS | 15 |
| 09.01.2020 | 29.05.2020 | INEOS E&P Norge AS | 100 |
| 13.11.2019 | 09.01.2020 | INEOS E&P Norge AS (Op.) | 40 |
| | | Petrolia NOCO AS | 30 |
| | | Wintershall Dea Norge AS | 30 |
| 02.03.2018 | 13.11.2019 | INEOS E&P Norge AS (Op.) | 40 |
| | | DEA Norge AS | 30 |
| | | Petrolia NOCO AS | 30 |

## Initial Work Obligations

At the date of award, phase 1 of the work programme leading to a drill or drop (DoD) decision was valid to 02.03.2019 but later extended to 03.02.2020. The work programme and duration of the license period is summarized in Table 1.2.

**Table 1.2 Work Programme and Duration**

<table>
<tr><th>Period</th><th>Phase (>0)</th><th>Duration [year] (0.0)</th><th>Work program</th><th>Decision at milestone</th></tr>
<tr><td rowspan="6">Initial period:</td><td rowspan="2">1</td><td>1.0</td><td>Reprocess 3D seismic, Purchase new 3D seismic contingent on reprocessing results</td><td>Drill or Drop</td></tr>
<tr><td>1.0</td><td>Extension</td><td>Drill or Drop</td></tr>
<tr><td>2</td><td>2.0</td><td>Drill exploration well</td><td>Concretize (BoK) or Drop</td></tr>
<tr><td>3</td><td>2.0</td><td>Drill exploration well</td><td>Continuation (BoV) or Drop</td></tr>
<tr><td>4</td><td>2.0</td><td>Prepare development plan</td><td>Submit PDO or Drop</td></tr>
<tr><td>Sum</td><td>8.0</td><td>Extension period [years] (>0.0):</td><td>30.0</td></tr>
</table>

In the first year of the initial phase the license carried out reprocessing (PreStack Pro conditioning) of the 3D seismic data set DG13001, seismic interpretation, and rock physics studies (incl. top reservoir response modelling). The prospect evaluation suggested that there could be a substantial potential, but high uncertainty and risk remained on trap definition (stratigraphic), reservoir pinch-out and base seal effectiveness.

Partners (DEA and Petrolia) concluded that none of the seismic datasets, neither DG13M01 nor the operator's in-house Pre-stack pro conditioned dataset of DG13M01, were of sufficient quality and resolution to mature Fat Canyon to a drill-ready prospect. New high quality 3D seismic was deemed necessary by the partnership majority to reduce the uncertainty and mitigate the risks. In November 2018, the majority of the partnership (comprising DEA and Petrolia) decided that the licence should apply for a 12 month extension to the decision to drill or drop to improve mapping of the Fat Canyon prospect using potentially better seismic data. The Operator (PGNiG, then INEOS) did not support the extension and commented on this in the application. The extension to the DoD decision was granted, and the updated work program consisted of purchasing PGS Geostreamer 3D seismic data 17M05NWS.

The license partnership acquired (licensed) part of the multi-client PGS Geostreamer 3D seismic data (PGS17M05NWS) and the data was conditioned with PreStack Pro. The resulting seismic data set was used as the basis for the mapping and re-evaluation of the Fat Canyon prospect. A detailed interpretation of the prospect's top and base reservoir led to a new understanding of the prospect with updated maps, outline (Fig. 1.2), target volumetrics and risking. The Operator considered the main risks of the prospect to be the base seal and presence of reservoir.

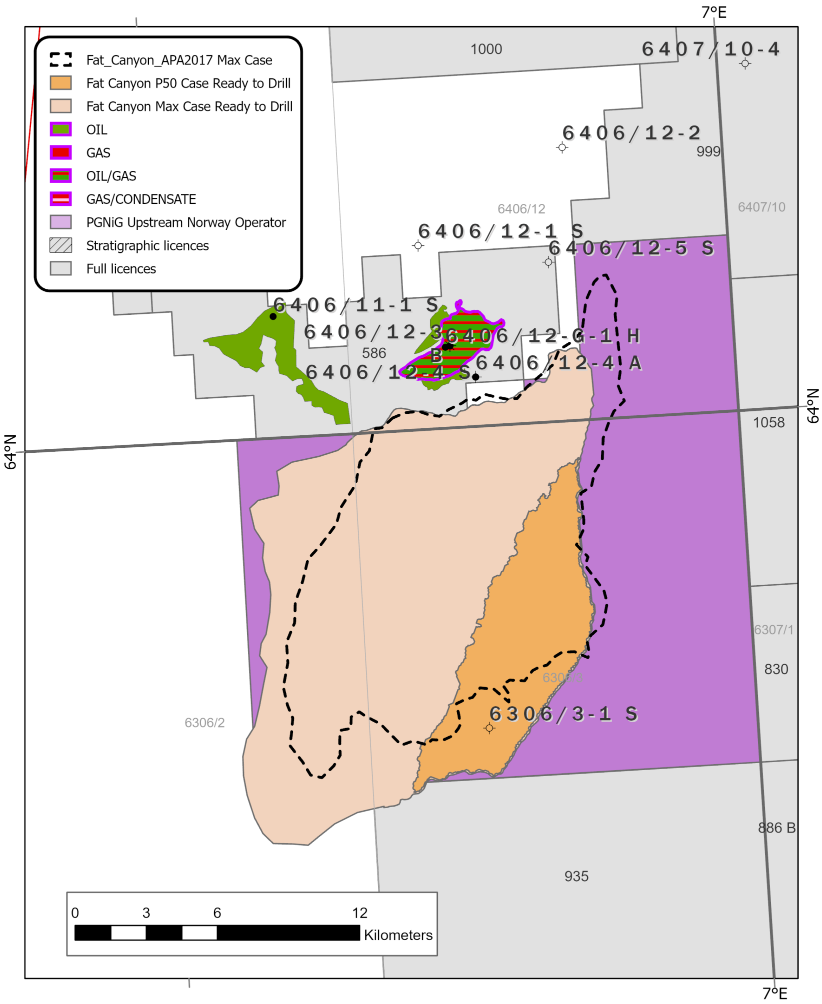


Fig. 1.2 PL937 Prospectivity map

Based on the re-evaluation of the Fat Canyon prospect, the Operator proposed a positive drill decision that was not supported by the partners. As a result, Wintershall DEA and Petrolia left the license and PGNiG retained a 100% share. In order to subsueqently take a positive drill decision, the Operator established a new partnership with Lime Petroleum AS, who acquired 15% share of interest from the Operator. Equinor Energy AS later joined the partnership during the drilling of the Fat Canyon prospect.

The well 6306/3-1 S and techncial sidetrack 6306/3-1 S T2 were drilled during Q3 and Q4 2021. The well was dry. In february 2022 the license partnership unanimously took a decision to drop the license at the BoK milestone.

### License Meetings

The technical evaluation, well planning and results were shared within the partnership through a series of meetings and workshops listed in Table 1.3.

**Table 1.3 License meetings 2018-2022**

| Meeting | Date |
|---|---|
| MC/EC No. 1 – License Establishment | 15 March 2018 |
| EC No. 2 – Rock Physics | 7 June 2018 |
| EC No. 3 – Mid Year Meeting | 7 August 2018 |
| MC No. 2 – Mid Year Meeting | 4 October 2018 |
| EC No. 4 – Mid Year Meeting | 9 November 2018 |
| MCNo. 3/EC No. 5 – Early Year Meeting | 12 February 2019 |
| EC No. 6 – Mid Year Meeting | 20 March 2019 |
| EC Work Meeting – PSPro Feasibility workshop | 15 May 2019 |
| EC Work Meeting – Interpretation workshop | 28 June 2019 |
| EC Work Meeting | 2 October 2019 |
| MC No. 4/EC No. 7 – Mid Year Meeting | 8 October 2019 |
| MC No. 5 - End Year Meeting | 28 November 2019 |
| MC/EC Work Meeting – Fat Canyon well planning | 26 March 2020 |
| MC No. 6/EC No. 8 – Mid Year Meeting | 11 June 2020 |
| MC No. 7/EC No. 9 – Mid Year Meeting | 13 October 2020 |
| MC No. 8/EC No. 10 – End Year Meeting | 2 December 2020 |
| MC No. 9/EC No. 11 – Mid Year Meeting | 31 May 2021 |
| MC No. 10/EC No. 12 – End Year Meeting | 26 November 2021 |
| MC No. 11/EC No. 13 - Well results and BoK proposal | 26 January 2022 |

### Reason for Relinquishment

The 6306/31 ST2 well tested the Fat Canyon Prospect. The well was dry and there are no other prospects or leads within the licensed acreage.

# 2 DATABASE OVERVIEWS

The agreed Common Database (CDB) for the license consists of released 2D seismic data and a combination of released and proprietary 3D seismic data (Fig. 2.1), and the released wells from the Frøya High and surrounding areas (Fig. 2.2 ). In addition, a few semi-regional studies were included.

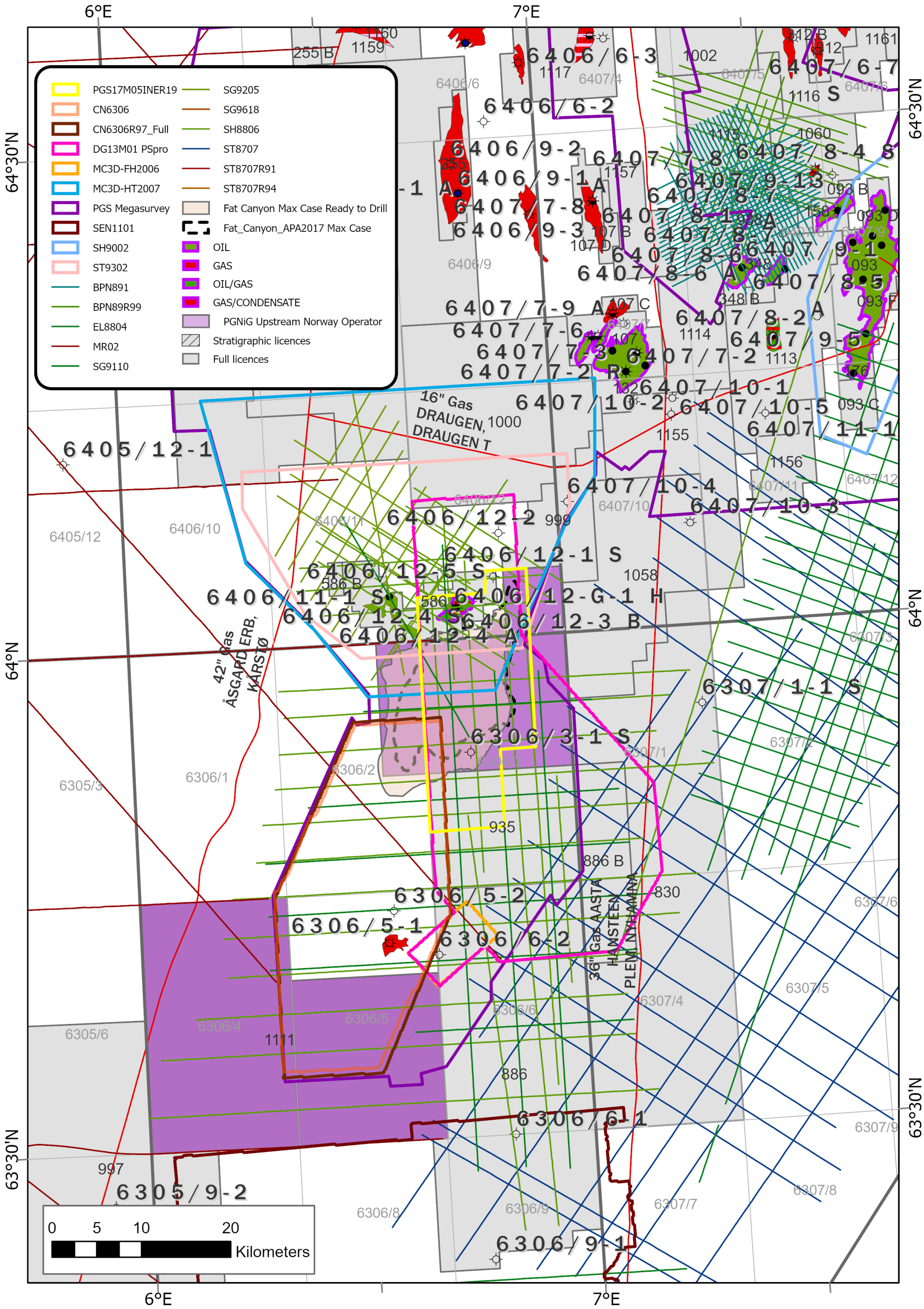


Fig. 2.1 PL937/PL937B Seismic Common Database

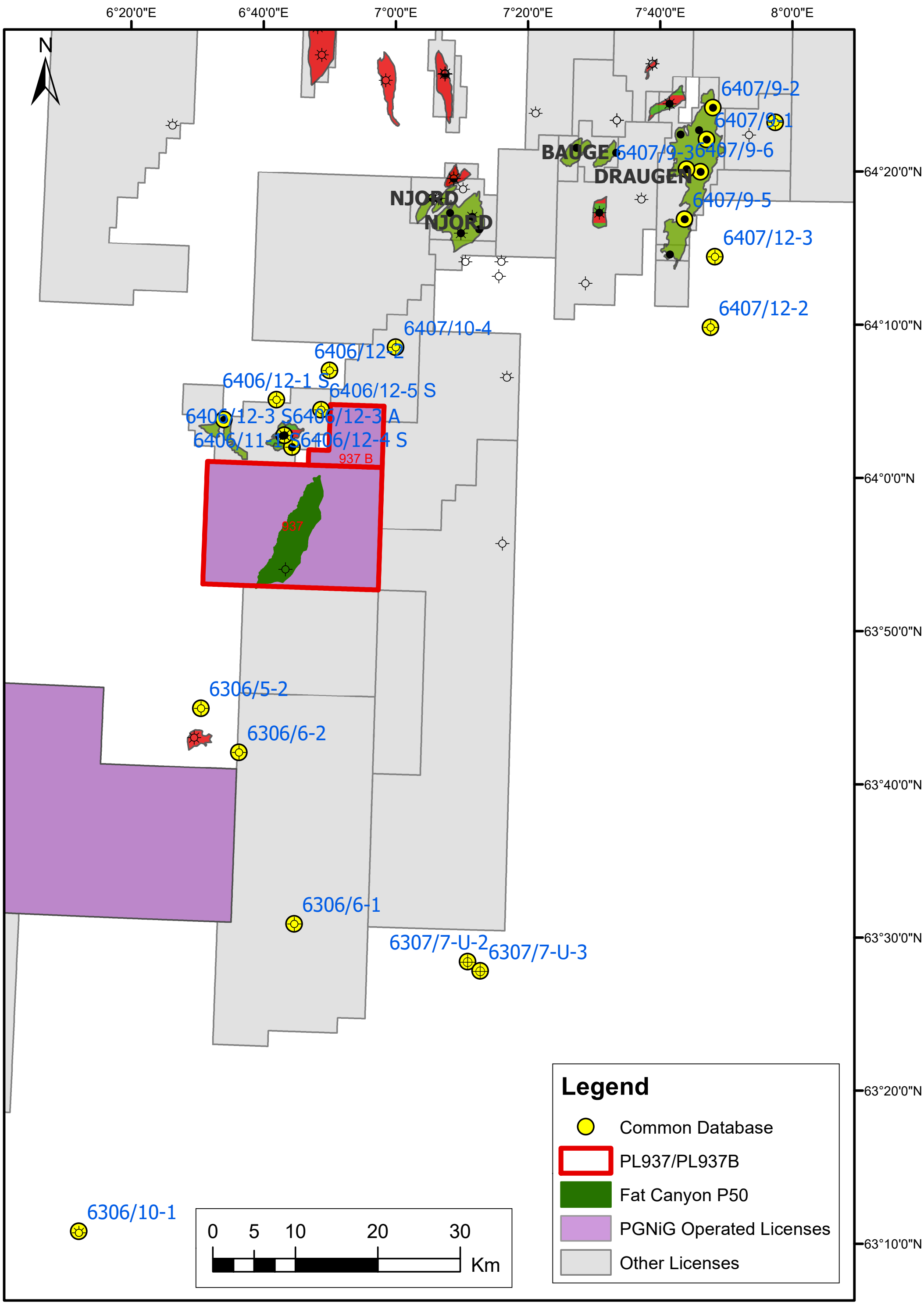


**Fig. 2.2 PL937/PL937B Well Database**
*Wells in the common database are highlighted in yellow.*

## 2.1 Seismic Data

For the purpose of regional evaluation, a selection of public 2D and 3D seismic surveys were included in the Common Data Base (CDB). As part of the license work program during the first two years, the license partnership conducted a conditioning using PreStack Pro of the 3D seismic data set DG13001 (NPDID 7890). The partnership then applied for, and was granted, a 1 year extension during which 300 km$^2$ of the PGS17M05NWS was purchased and conditioned using PreStack Pro. The resulting seismic survey PGS17M05INER19 was then included in the CDB and used for further technical evaluation. Fig. 2.1 displays the location of the seismic surveys and Table 2.1 lists the complete seismic database used by the license partnership.

**Table 2.1 PL937/PL937B Seismic database**

| Seismic Survey | NPDID | Type | Status | Year | Company |
|---|---|---|---|---|---|
| DG13M01 | Merge | 3D | Public | 2015 | DONG E&P Norge |
| DG13001 | 7890 | 3D | Public | 2013 | DONG E&P Norge |
| PGS14005 | 8054 | 3D | Licensed | 2014 | Multiklient Invest AS |
| PGS17M05NWS | Merge | 3D | Licensed | 2017 | Multiklient Invest AS |
| PGS17M05INER19 | Merge | 3D | Licensed | 2019 | INEOS Norge |
| MC3D-FH2006 | 4352 | 3D | Public – Full Offset | 2006 | PGS NOPEC A/S |
| CN6306R97 | Reproc. | 3D | Public | 1998 | Amerada Hess |
| CN6306 | 3638 | 3D | Public | 1994 | ConocoPhilips |
| ST9302 | 3626 | 3D | Public | 1993 | Den norske stats oljeselskap a.s |
| SEN1101 | 7443 | 3D | Public | 2011 | Spring Energy Norway AS |
| SH9002 | 3344 | 3D | Public | 1990 | A/S Norske Shell |
| MC3D-HT2007 | 4447 | 3D | Public – Full Offset | 2008 | PGS NOPEC A/S |
| BPN-89R99 | Reproc. | 2D | Public | 1989 | BP Norway |
| BPN891 | 3364 | 2D | Public | 1991 | BP Norway |
| EL-8804 | 3096 | 2D | Public | 1988 | Elf Petroleum Norge AS |
| MR02 | NA | 2D | Public – Full Offset | 2002 | FUGRO-GEOTEAM |
| SG9110 | 3433 | 2D | Public | 1991 | Saga Petroleum ASA |
| SG9205 | 3549 | 2D | Public | 1992 | Saga Petroleum ASA |
| SG9618 | 3815 | 2D | Public | 1996 | Saga Petroleum ASA |
| SH8806 | 3163 | 2D | Public | 1988 | A/S Norske Shell |
| ST8707 | 3038 | 2D | Public | 1987 | Den norske stats oljeselskap a.s |
| ST8707R91 | Reproc. | 2D | Public | 1991 | Den norske stats oljeselskap a.s |
| ST8707R94 | Reproc. | 2D | Public | 1994 | Den norske stats oljeselskap a.s |

## 2.2 Well Data

The key wells used for the prospect evaluation are highlighted in Fig. 2.2. The common well database includes all released wells in the area as listed in Table 2.2.

**Table 2.2 PL937/PL937B common well database**

| Well | NPDID | Content | Year | Company |
|---|---|---|---|---|
| 6306/5-2 | 7726 | DRY | 2015 | Repsol Exploration Norge AS |
| 6306/6-1 | 2384 | DRY | 1994 | Den norske stats oljeselskap a.s |
| 6303/6-2 | 6143 | DRY | 2009 | Det norske oljeselskap ASA (old) |
| 6306/10-1 | 1551 | OIL/GAS SHOWS | 1990 | A/S Norske Shell |
| 6307/7-U-2 | 1269 | SCIENTIFIC | 1988 | IKU Petroleumsforskning SINTEF Gruppen |
| 6307/7-U-3 | 1270 | SCIENTIFIC | 1988 | IKU Petroleumsforskning SINTEF Gruppen |
| 6406/11-1S | 1539 | OIL | 1991 | Saga Petroleum ASA |
| 6406/12-1S | 1711 | DRY | 1991 | Den norske stats oljeselskap a.s |
| 6406/12-2 | 2640 | DRY | 1995 | Den norske stats oljeselskap a.s |
| 6406/12-3A | 7432 | OIL | 2014 | VNG Norge AS |
| 6406/12-3S | 7322 | OIL/GAS | 2014 | VNG Norge AS |
| 6406/12-4A | 7774 | DRY | 2015 | VNG Norge AS |
| 6406/12-5S | 7787 | DRY | 2015 | VNG Norge AS |
| 6407/9-1 | 133 | OIL | 1984 | A/S Norske Shell |
| 6407/9-2 | 449 | OIL | 1985 | A/S Norske Shell |
| 6407/9-3 | 469 | OIL | 1985 | A/S Norske Shell |
| 6407/9-5 | 492 | OIL | 1985 | A/S Norske Shell |
| 6407/9-6 | 871 | OIL | 1986 | A/S Norske Shell |
| 6407/9-8 | 1974 | DRY | 1992 | A/S Norske Shell |
| 6407/10-2 | 1497 | SHOWS | 1990 | Norsk Hydro Produksjon AS |
| 6407/10-3 | 1927 | SHOWS | 1992 | Norsk Hydro Produksjon AS |
| 6407/10-4 | 7699 | DRY | 2016 | Lundin Norway AS |

## 2.3 Studies

The following special studies were included in the CDB:

- Integrated Norwegian Study (Sintef, 2010)
- South Halten Terrace and Møre Stratigraphic Database (Ichron, 2015)

# 3 RESULTS OF GEOLOGICAL AND GEOPHYSICAL STUDIES

The main challenges of the Fat Canyon prospect definition was the resolution and interpretation of the perceived Top Reservoir horizon, which was believed to be of Late Jurassic age, its lateral termination (pinch out), and the interpretation of the Base Cretaceous Unconformity (BCU). This uncertainty was address with the PreStack Pro conditioning of two different seismic surveys and the quality and resolution of each is illustrated in Fig. 3.1. The original interpretation was conducted in the DG13M01 survey (Fig. 3.1, **a**) for the APA 2017 application and, during the first exploration period, this survey was conditioned using PreStack Pro (Fig. 3.1, **b**). Although there was an improvement of the resolution, the uncertainty regarding the lateral termination of the perceived Top Reservoir and the stratigraphic relationship of the interpreted reservoir section with the BCU was not resolved. During the licence extension period, 300 $km^2$ of the PGS17M05NWS was purchased and conditioned in PreStack Pro (Fig. 3.1, **c**) and subsequently conditioned in Geoteric using noise cancellation and spectral enhancement operations (Fig. 3.1, **d**). The PGS17M05INER19 conditioning resulted in an improved continuity of the reflectors and increased interpretation confidence and led to an alternative stratigraphic interpretation and an increased risk on lateral seal. This was the seismic data set used for the final prospect evaluation and resulted in an update of the reservoir age, properties and risk.

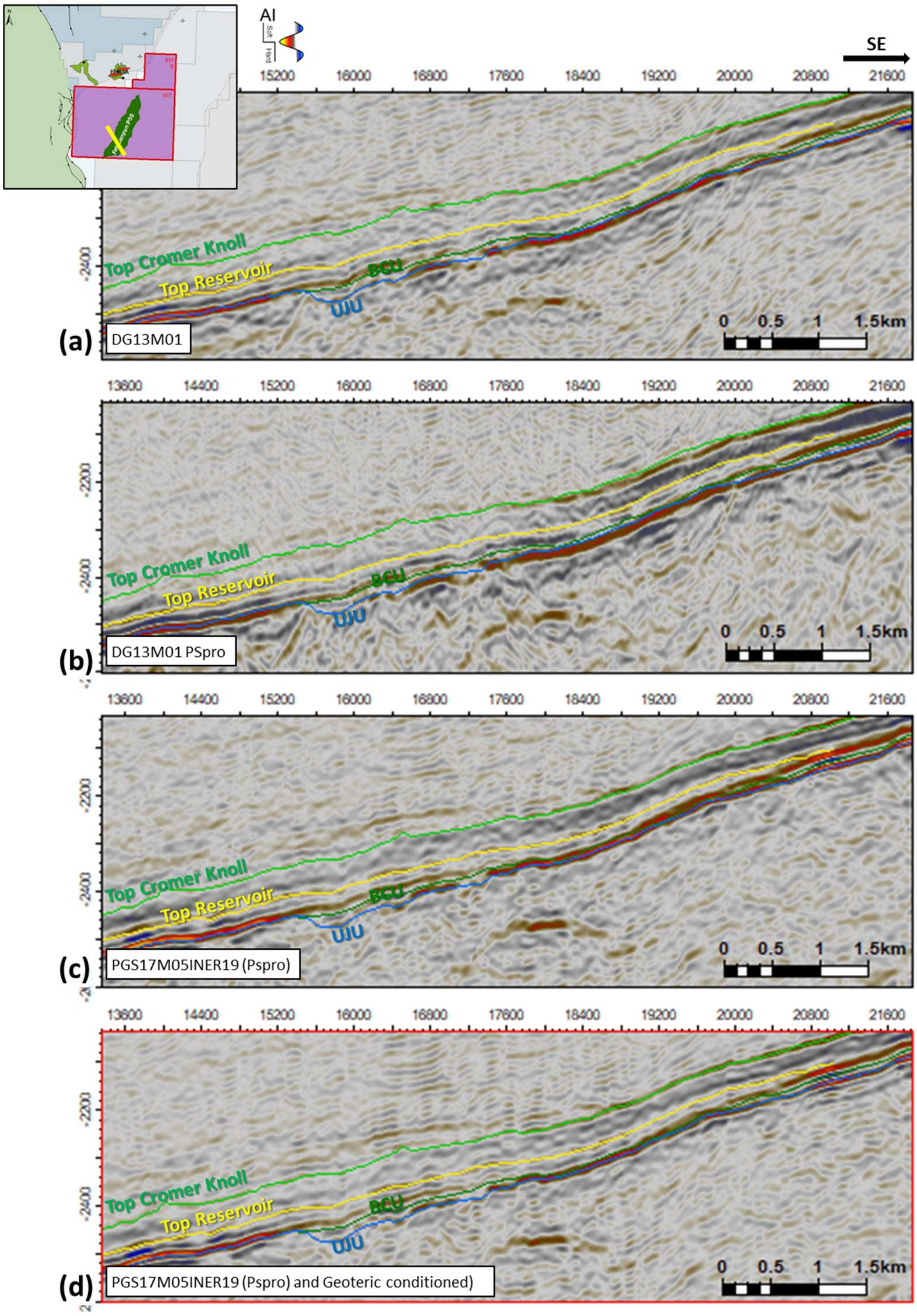


**Fig. 3.1 Conditioning of seismic survey during the work program**

Table 3.1 lists the studies carried out in PL937 and PL937B and their outcome.

## Table 3.1 Summary of Work Programme Scope and outcome

| Action | Comments | Outcome |
|---|---|---|
| **Reprocessing/ Seismic conditioning** | Commitment. PSpro conditioning of survey DG13M01 during initial exploration period.<br><br>Acquisition and conditioning PSpro conditioning of 300 km2 of survey PGS17M05NWS during extension period. | Improved resolution with resulting **DG13M01 Pspro** but seal risk remained high.<br><br>Improved resolution with resulting **PGS17M05INER19**. Seal risk remained high but an alternative interpretaion of the prospect resulted in a change of reservoir concept. |
| **Seismic modelling** | Modelling conducted both in DG13M01 Pspro and PGS17M05INER19 to test interpretation scenarios and strategy. | Modelling does not support the interpretation of an underlying higher AI and shale prone Cromer Knoll section below the Lange Fm to continue up upon the Frøya High area.<br><br>Modelling supports the presence of a low AI section which could be either porous sands or low AI shales. |
| **Basin modelling** | Area was previously licensed as PL689 and a dedicated Basin Modelling and Geochemistry study was conducted. The outcome of these studies was used in PL937. | The migration and charge concepted/risk has not changed. |
| **Biostratigraphy** | Integrate data from offset wells in order to identify missing sections and limit the age uncertainty of the Fat Canyon reservoir.<br><br>Integrate with seismic (seismic stratigraphy). | Lower Cretaceous sandstones identified in offset well, reducing the risk for the presence of reservoir. |
| **Seismic interpretation** | Optimise alternative interpretations of the PL937/PL937B area for prospect specific mapping and evaluation. | Alternative interpretation using PGS17M05INER19 and Geoteric analyis resulted in more confidence in the presence of a Lower Cretaceous reservoir overlaying an Upper Jurassic sequence. |
| **Prospect assessment** | Interpretation of new data and incorporate the knowledge gained from studies into volumes calculation and risking. | Same volume potential but increased risk, mostly due to base seal risk.<br><br>The estimated volumes and revised risking did not impact the Operator's recommendation to drill Fat Canyon. |
| **Well drilling** | The well was drilled to test Fat Canyon's presence of HC. | The well was classified as dry. The Lower Cretaceous reservoir is not present. The Upper Jurassic reservoir is present but water wet and tight. |

# 4 PROSPECT UPDATE REPORT

The application submitted by INEOS in 2017 contained one prospect, Fat Canyon, envisaged to belong to the Late Jurassic Rogn and/or Melke plays. The outline of the of the prospect was defined using the DG13001 survey and is illustrated in Fig. 4.1 (black dashed outline). During the licence exploration period, as a consequence of the work program and reinterpretation using the PGS17M05INER19 survey, the geological concept, and consequently the outline of the prospect, has changed. The updated outline of the prospect is illustrated in Fig. 4.1 (green outline). In the updated interpretation the reservoir comprises an upper Lyr Fm zone of Early Cretaceous age and a lower Rogn Fm zone of Late Jurassic age.

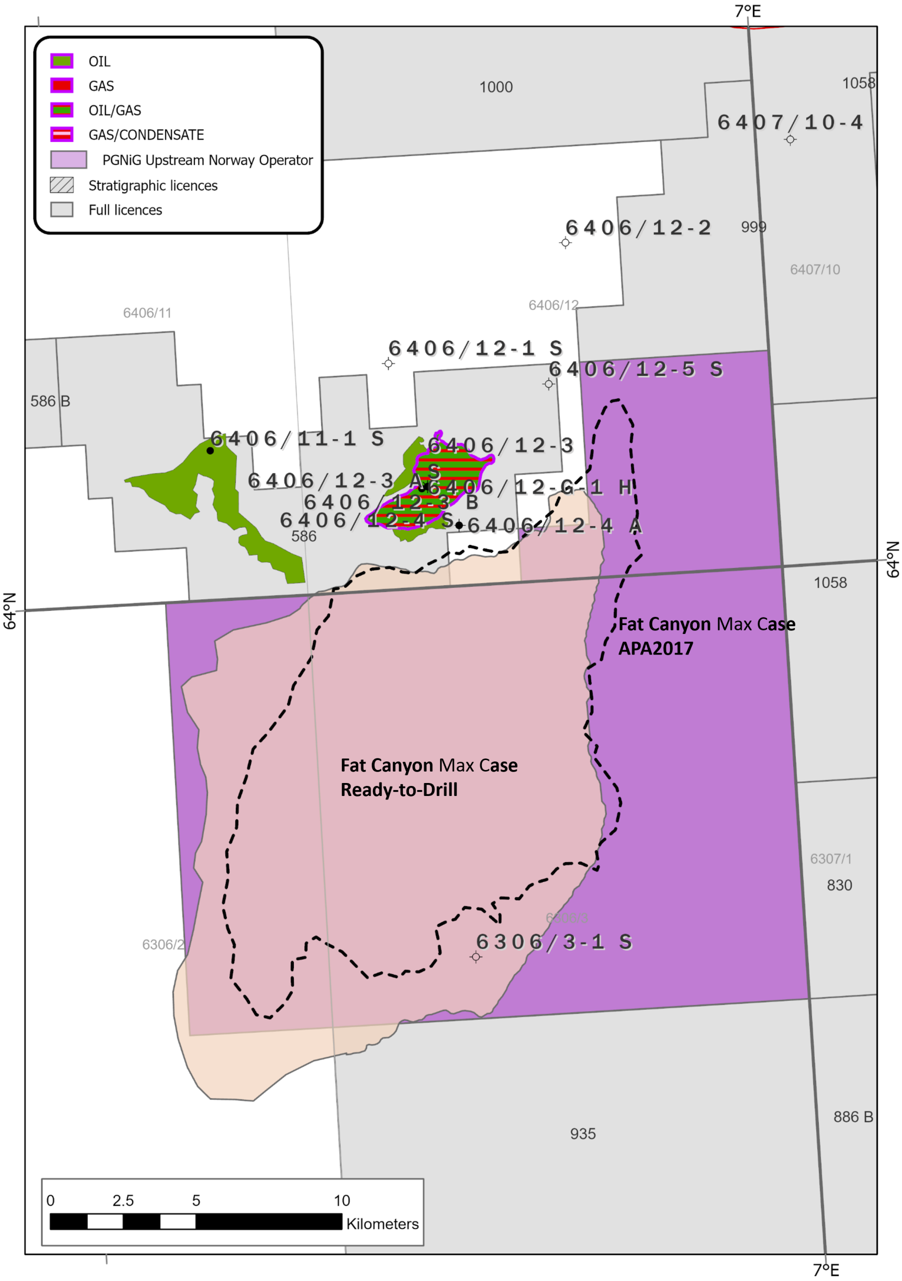


Fig. 4.1 Prospect outline at the time of the application (dashed black) and after reevaluation prior to drilling (filled).

Table 4.1 displays the prospect data at the time of the APA2017 evaluation.

**Late Jurassic Play**

Following the 2017 APA, the Fat Canyon prospect was interpreted to be a stratigraphically entrapped sandstone body relying on a proximal pinch-out of the Late Jurassic Melke and Rogn Fms. Both reservoirs were thought to be shallow-marine sandstones with favourable primary depositional properties, but with complex internal reservoir architecture. The depositional model and properties derived from seismic inversion supported the presence of porous sandstones, however, uncertainty existed as to the preservation of reservoir properties and its producibility. The anticipated top seal consisted of the overlying Early Cretaceous mudstones of the Cromer Knoll Gp. and locally the Late Jurassic Spekk Fm. Base seal relied on basement characteristics, and this was the critical risk for Fat Canyon due to the possibility of a fractured basement. Hydrocarbon charge was expected to be from the Spekk Fm. shales in the deeper Gimsan Basin with migration into the Fat Canyon prospect from the North across the Klakk/Vingleia Fault. The most relevant analogue for Fat Canyon was the Pil discovery north of the application area in the hangingwall of the Klakk/Vingleia Fault. Fat Canyon was then interpreted to be part of the same depositional system that supplied the sediments forming the Pil (Melke Fm.) and Bue (Rogn Fm.) reservoirs during the Late Jurassic.

After the execution of the work program during the first exploration period, the partners considered that the seismic survey DG13M01 PreStack Pro did not have enough quality to resolve some of the key interpretation uncertainties. The base and lateral seal risks were considered the main risks, but there was also an interpretation uncertainty. The partners applied for and were granted a one-year extension period, during which 300 km$^2$ of PGS data was purchased and PreStack Pro conditioned (PGS17M05INER19). The interpretation of the PGS17M05INER19 resulted in an alternative interpretation of the stratigraphy of the reservoir and a re-evaluation of the Fat Canyon prospect as a combination of an Early Cretaceous Lyr Fm reservoir overlying a Late Jurassic Rogn Fm. reservoir. Fig. 4.2 illustrates both alternative interpretations displayed on the PGS17M05INER19 seismic data set.

**Early Cretaceous Play**

The Fat Canyon prospect was defined by an isopach anomaly between the Top Basement / Upper Jurassic Unconformity (UJU) and the Intra-Albian Unconformity, and it was limited laterally by a stratigraphic pinch-out to the East and South and by the Klakk/Vingleia fault system to the West and North. The depth map of the Top Reservoir is illustrated in Fig. 4.3. Two reservoir units of Late Jurassic and Early Cretaceous age, possibly separated by a flooding shale, were interpreted between the UJU and Top Cromer Knoll. The Late Jurassic Rogn Fm equivalent sandstone was mapped as an erosive incision filling event and interpreted to be a flood plain system of fluvial channel fill, crevasse splays, and levee deposits. The Early Cretaceous Lyr Fm equivalent sandstone was believed to correspond to a combination of an an estuarine channel fill, tidal bars, and an overlying delta-top fan.

## Table 4.1 Fat Canyon prospect data at time of application

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Block | 6306/3 | Prospect name | Fat Canyon | Discovery/Prosp/Lead | Prospect | Prosp ID (or New!) | NPD will insert value | NPD approved (Y/N) | |
| Play name | Melke/Rogn | New Play (Y/N) | No | Outside play (Y/N) | No | | | | |
| Oil, Gas or O&G case: | Oil | Reported by company | DONG E&P Norge | Reference document | | | | Assessment year | 2017 |
| This is case no.: | 1 of 1 | Structural element | Frøya High | Type of trap | Stratigraphic | Water depth [m MSL] (>0) | 265 | 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) | 14.50 | 59.60 | 70.50 | 139.70 | | | | |
| | Gas [$10^9$ $Sm^3$] (>0.00) | | | | | 2.83 | 11.90 | 14.60 | 30.00 |
| Recoverable resources | Oil [$10^6$ $Sm^3$] (>0.00) | 5.91 | 24.40 | 29.30 | 58.50 | | | | |
| | Gas [$10^9$ $Sm^3$] (>0.00) | | | | | 1.14 | 4.87 | 6.23 | 13.10 |
| Reservoir Chrono (from) | Oxfordian | Reservoir litho (from) | Melke Fm. sand | Source Rock, chrono primary | Spekk Formation | Source Rock, litho primary | Shale | Seal, Chrono | Spekk Formation |
| Reservoir Chrono (to) | Volgian | Reservoir litho (to) | Rogn Formation | Source Rock, chrono secondary | | Source Rock, litho secondary | | Seal, Litho | Shale |
| **Probability [fraction]** | | | | | | | | | |
| Total (oil + gas + oil & gas case ) (0.00-1.00) | 0.24 | Oil case (0.00-1.00) | 1.00 | Gas case (0.00-1.00) | 0.00 | Oil & Gas case (0.00-1.00) | 0.00 | | |
| Reservoir (P1) (0.00-1.00) | 0.70 | Trap (P2) (0.00-1.00) | 0.70 | Charge (P3) (0.00-1.00) | 0.70 | Retention (P4) (0.00-1.00) | 0.70 | | |
| **Parametres:** | Low (P90) | Base | High (P10) | *Base, Mode (P50)* | | | | | |
| Depth to top of prospect [m MSL] (> 0) | 2170 | 2170 | 2170 | *Base for parameters: mean value* | | | | | |
| Area of closure [$km^2$] (> 0.0) | 8.4 | 29.5 | 54.0 | *Top and Base reservoir used for computing GRV* | | | | | |
| Reservoir thickness [m] (> 0) | | | | | | | | | |
| HC column in prospect [m] (> 0) | 138 | 248 | 336 | | | | | | |
| Gross rock vol. [$10^9$ $m^3$] (> 0.000) | 11.290 | 11.909 | 12.513 | | | | | | |
| Net / Gross [fraction] (0.00-1.00) | 0.47 | 0.62 | 0.76 | | | | | | |
| Porosity [fraction] (0.00-1.00) | 0.13 | 0.16 | 0.22 | | | | | | |
| Permeability [mD] (> 0.0) | 10.0 | 100.0 | 300.0 | | | | | | |
| Water Saturation [fraction] (0.00-1.00) | 0.20 | 0.30 | 0.40 | | | | | | |
| Bg [Rm3/Sm3] (< 1.0000) | | | | | | | | | |
| 1/Bo [Sm3/Rm3] (< 1.00) | 0.67 | 0.71 | 0.77 | | | | | | |
| GOR, free gas [$Sm^3/Sm^3$] (> 0) | | | | | | | | | |
| GOR, oil [$Sm^3/Sm^3$] (> 0) | 147 | 209 | 276 | | | | | | |
| Recov. factor, oil main phase [fraction] (0.00-1.00) | 0.35 | 0.42 | 0.50 | | | | | | |
| Recov. factor, gas ass. phase [fraction] (0.00-1.00) | 0.35 | 0.42 | 0.50 | | | | | | |
| Recov. factor, gas main phase [fraction] (0.00-1.00) | | | | | | | | | |
| Recov. factor, liquid ass. phase [fraction] (0.00-1.00) | | | | For NPD use: | | | | | |
| Temperature, top res [°C] (>0) | 124 | | | 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) | 230 | | | 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 |

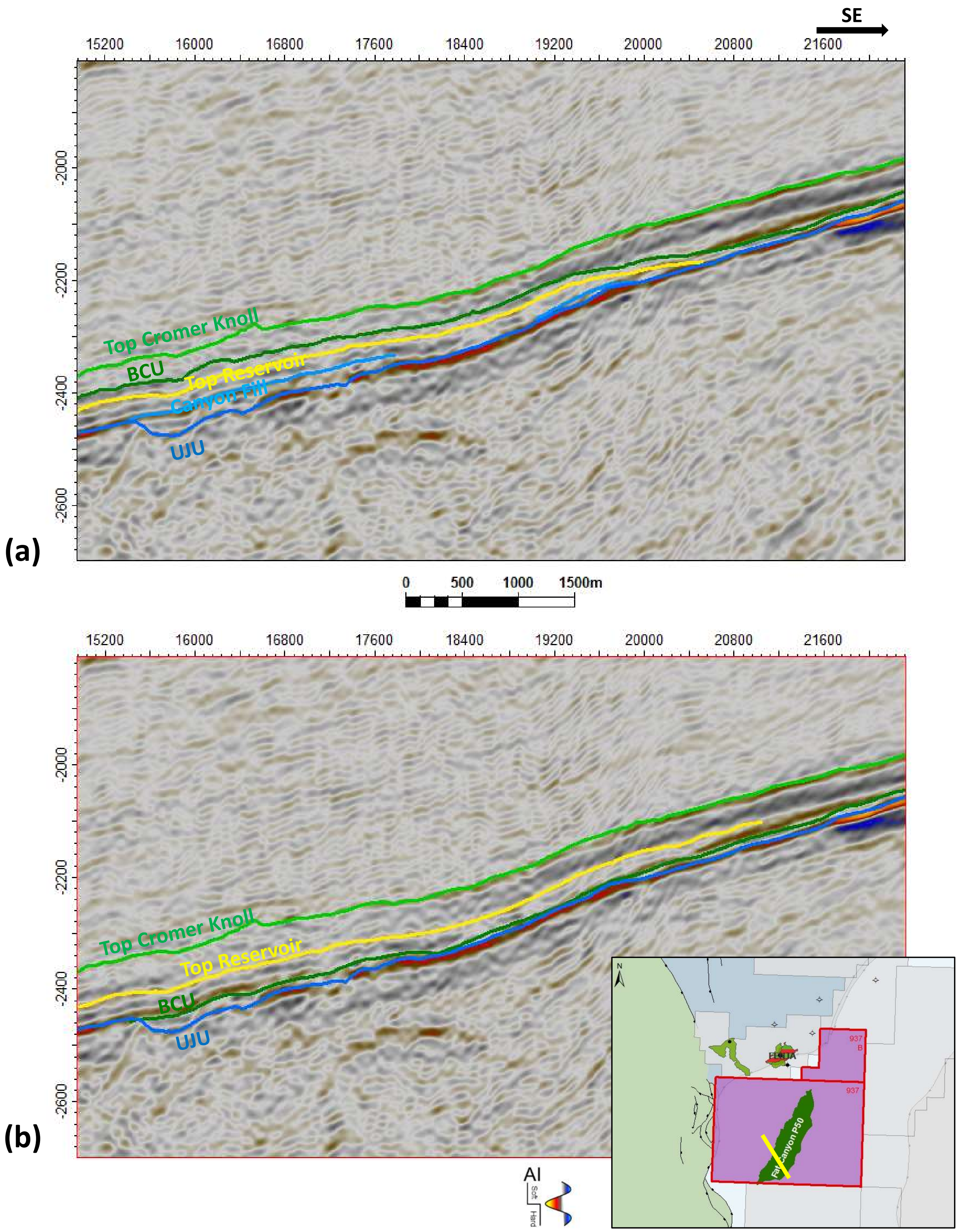


**Fig. 4.2 Pre-drill alternative interpretations**

*(a) in this interpretation the entire reservoir section is assigned a Late Jurassic age.*

*(b) in this interpretation the upper part of the reservoir section is assigned an Early Cretaceous age. The lower part of the reservoir section is considered to be Late Jurassic in age.*

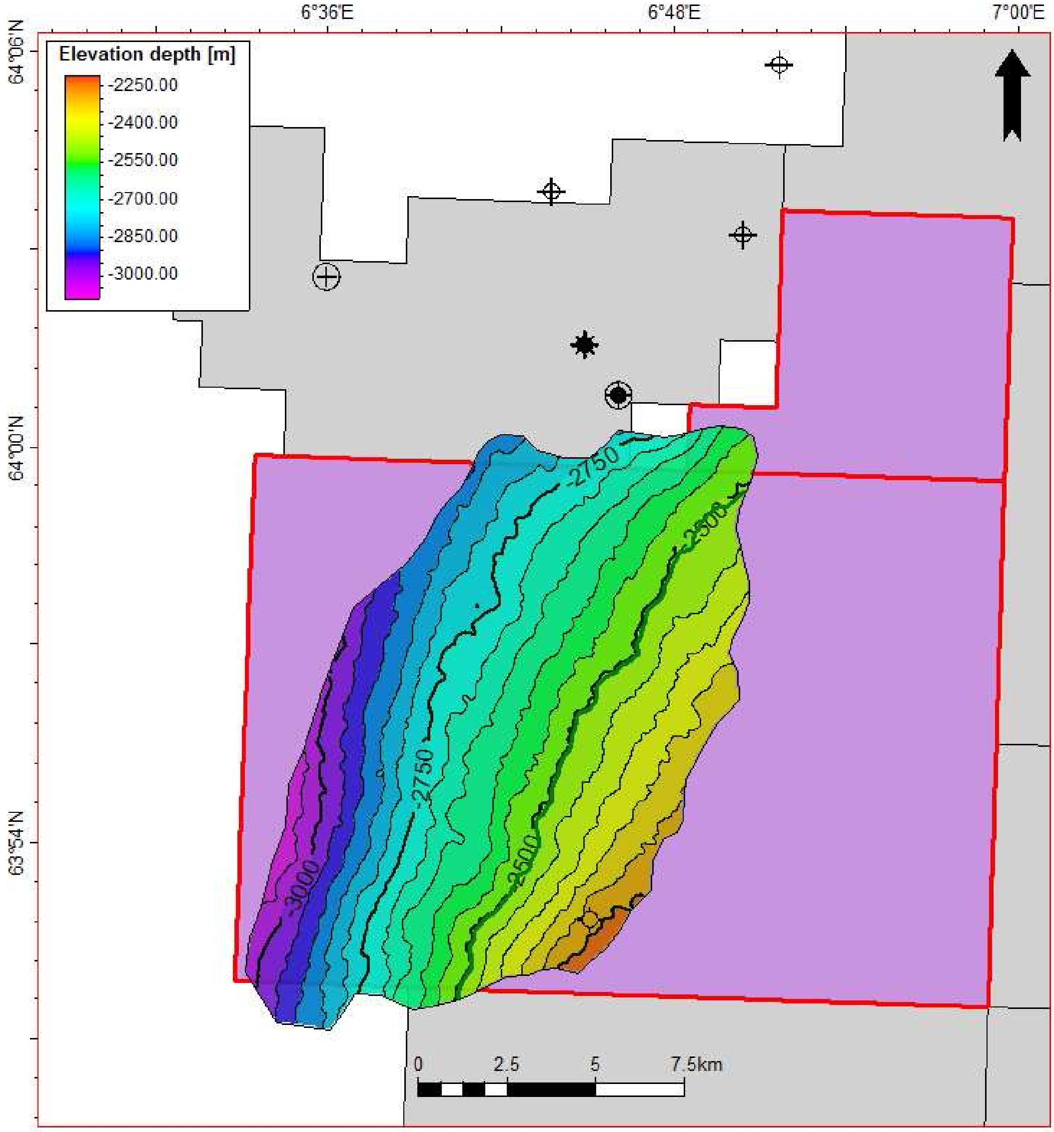


**Fig. 4.3 Depth Map of Top Reservoir of Fat Canyon prospect**
*The green line at 2495m depth corresponds to the P50 HC contact.*

The Base Cretaceous Unconformity is regionally mapped on seismic data as a soft event (decrease in acoustic impedance), and it is a clear unconformity on the eastern side of the Frøya High. However, at the prospect location this soft event appears to be masked by a stronger hard event interpreted to be the top of a Late Jurassic sand. The top reservoir horizon was seismically defined as a hard event (increase in the acoustic impedance) within the Early Cretaceous section, and it was interpreted to represent the top of a reservoir body pinching out onto a paleo-water divide on the Frøya High. This reservoir section was interpreted to be overlain by Early Cretaceous flooding shales of the Lyr and Lange Fms. Fig. 4.4 shows dip- and strike-lines through the Fat Canyon prospect and well target location.

The nature and composition of the "Basement" below Fat Canyon is uncertain due to lack of analogue well data on the Frøya High. From seismic data the Top Basement/ UJU marker is characterized by a rather pronounced hard acoustic response and as such constitute a "seismic basement". However, steeply dipping seismic reflectors observed

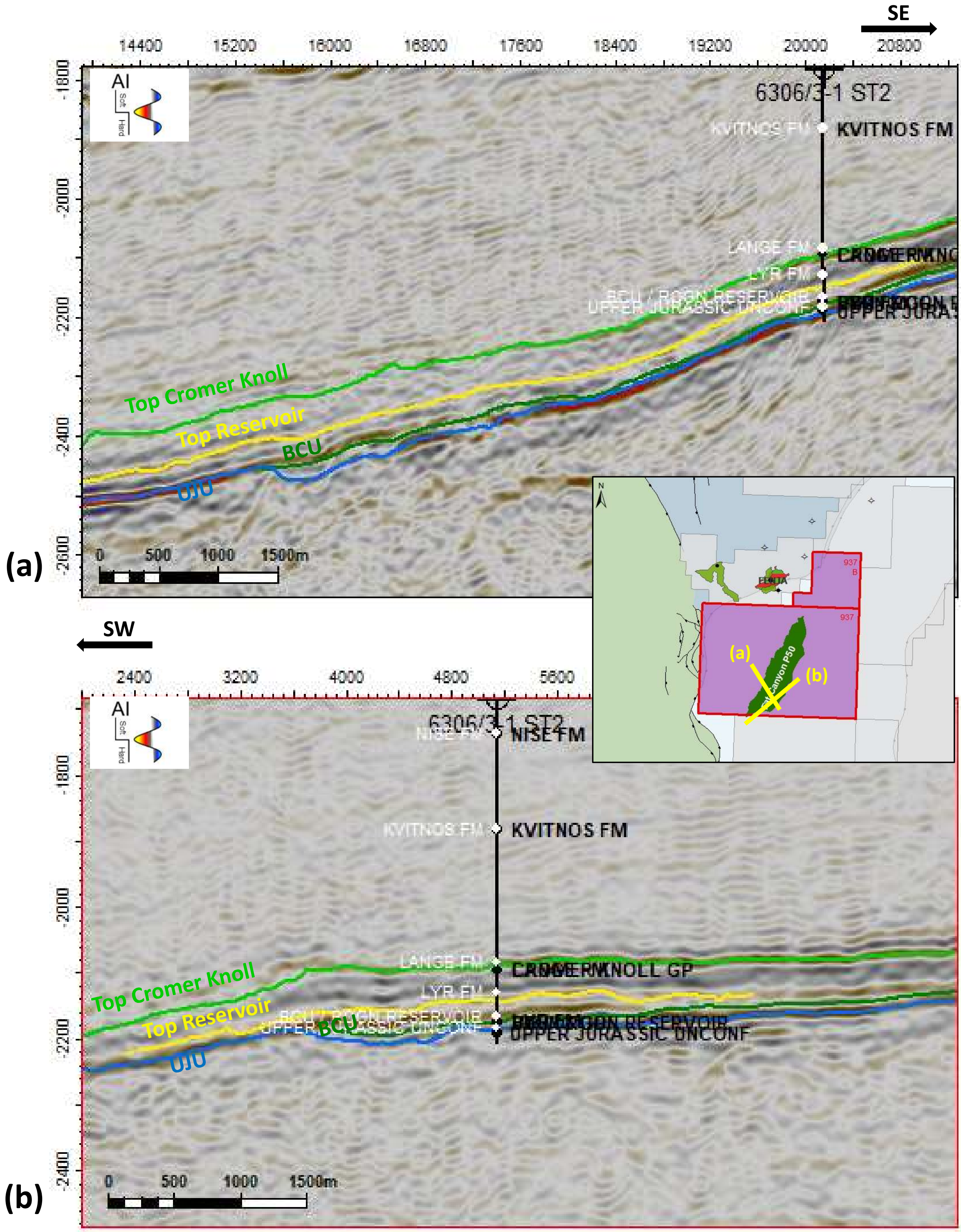


**Fig. 4.4 Fat Canyon prospect dip and strike seismic sections**
*(a) Dip section*
*(b) Strike section*

*Both lines displaying pre-drill interpretation. Well tops in white are pre-drill prognosed and well tops in black are actual ones.*

in the basement, together with gravity data showing a drop in density across the high, could be interpreted as possible inlier basins containing sedimentary rocks, probably of Triassic age. An alternative interpretation is that the Basement consists of granitic or metamorphic rocks and that the steeply dipping reflectors represents a complex system of faults, fractures, and mafic dykes and sills. Some variability is observed in the amplitude strength of the Top Basement/UJU seismic marker which could indicate remnants of weathered basement rocks.

The outline of the prospect corresponds to the outline of the interpreted Early Cretaceous reservoir section pinching out towards the southeast. The expected range of the reservoir properties was derived from the nearby well 6306/6-2 and East Greenland outcrop analogues, with the most likely (P50) Net/Gross of 63 %, effective porosity of 16 %, effective HC saturation of 70 % and average permeability around 100 mD.

The main geological risk for the Fat Canyon prospect was considered to be trap validity, followed by reservoir presence as the second largest risk element. The overall probability of finding moveable hydrocarbons (POFH) in Fat Canyon was 20%. Forward modelling of rock properties from nearby wells indicated that very little to no seismic amplitude variation should be expected between water and oil filled reservoir. The prospect risk was therefore assessed on geological factors only, with no contribution from amplitude character.

Volumetric studies completed by INEOS E&P Norway showed a range from 33 MSm3 (P90) to 164 MSm3 (P10) in place for the most likely scenario of an oil case discovery. A full overview of the ready-to-drill prospect data are listed in Table 4.2 .

**6306/3-1 S and 6306/3-1 ST2 wells**

The 6306/3-1 S was the original wellbore meant to test the Fat Canyon prospect. It was drilled as a slanted well and had technical problems while setting the 9 5/8" casing, which resulted in the drilling of the technical sidetrack 6306/3-1 ST2.

The wellbores 6306/3-1 S and 6306/3-1 ST2 were drilled during the autumn of 2021 and TD'ed in the Lange Fm and Basement, respectively. Although the encoutered stratigraphy was shallower than anticipated, the well tops depths were largely in-line with pre-drill expectations and within error. The well did not prove any reservoir in the Lyr Fm but has proved fair reservoir in the Rogn Fm. There were no hydrocarbon shows recorded during drilling, but from post-well cuttings analyses there are strong indications that hydrocarbons have migrated into the prospect. Hence, the prospect failed most likely due to lack of a lateral seal on the stratigraphic trap. Post-well geochemical and mineralogical analyses results will be documented in the Geological Completion Report (PGNiG Upstream Norway AS, 2022).

## Table 4.2 Fat Canyon prospect data pre-drill

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Block | 6306/3 | Prospect name | Fat Canyon | 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 | INEOS O&G Norway | Reference document | | | | Assessment year | 2021 |
| This is case no.: | 1 of 1 | Structural element | Frøya High | Type of trap | Stratigraphic | Water depth [m MSL] (>0) | 241 | 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) | 33.00 | 87.00 | 93.00 | 164.00 | | | | |
| | Gas [$10^9$ $Sm^3$] (>0.00) | | | | | 3.00 | 18.00 | 12.00 | 25.00 |
| Recoverable resources | Oil [$10^6$ $Sm^3$] (>0.00) | 8.00 | 36.00 | 46.00 | 98.00 | | | | |
| | Gas [$10^9$ $Sm^3$] (>0.00) | | | | | 1.00 | 4.00 | 6.00 | 15.00 |
| Reservoir Chrono (from) | Early Cretaceous | Reservoir litho (from) | Lyr sst Fm | Source Rock, chrono primary | Late Jurassic | Source Rock, litho primary | Spekk Fm | Seal, Chrono | Early Cretacous |
| Reservoir Chrono (to) | Late Jurassic | Reservoir litho (to) | Rogn Fm | Source Rock, chrono secondary | Late Jurassic | Source Rock, litho secondary | Melke Fm | Seal, Litho | Cromer Knoll Gp |
| **Probability [fraction]** | | | | | | | | | |
| Total (oil + gas + oil & gas case ) (0.00-1.00) | 0.20 | Oil case (0.00-1.00) | 0.20 | Gas case (0.00-1.00) | 0.00 | Oil & Gas case (0.00-1.00) | 0.20 | | |
| Reservoir (P1) (0.00-1.00) | 0.57 | Trap (P2) (0.00-1.00) | 0.45 | Charge (P3) (0.00-1.00) | 0.80 | Retention (P4) (0.00-1.00) | 1.00 | | |
| **Parametres:** | Low (P90) | Base | High (P10) | *The reservoir comprise in the base case estimation two zones in hydraulic communication with a common pressure and oil water contact. The two zones are a Late Jurassic fluvially dominated canyon fill overlain by a shallow marine deltaic sandstone package of prograding clinoforms.* *The in-place and recoverable resources "Base,Mode" numbers are P50 numbers from the final GeoX model for Fat Canyon. The individual "Base" numbers for the input parameters are GeoX distribution mode numbers. This is approach is in accordance with INEOS O&G best practices.* | | | | | |
| Depth to top of prospect [m MSL] (> 0) | | 2340 | | | | | | | |
| Area of closure [$km^2$] (> 0.0) | | 39.0 | | | | | | | |
| Reservoir thickness [m] (> 0) | | 80 | | | | | | | |
| HC column in prospect [m] (> 0) | 170 | 280 | 360 | | | | | | |
| Gross rock vol. [$10^9$ $m^3$] (> 0.000) | | 1.400 | | | | | | | |
| Net / Gross [fraction] (0.00-1.00) | 0.48 | 0.63 | 0.83 | | | | | | |
| Porosity [fraction] (0.00-1.00) | 0.14 | 0.16 | 0.19 | | | | | | |
| Permeability [mD] (> 0.0) | | 100.0 | | | | | | | |
| Water Saturation [fraction] (0.00-1.00) | 0.60 | 0.70 | 0.80 | | | | | | |
| Bg [Rm3/Sm3] (< 1.0000) | | | | | | | | | |
| 1/Bo [Sm3/Rm3] (< 1.00) | 0.68 | 0.75 | 0.82 | | | | | | |
| GOR, free gas [$Sm^3/Sm^3$] (> 0) | | | | | | | | | |
| GOR, oil [$Sm^3/Sm^3$] (> 0) | 78 | 116 | 162 | | | | | | |
| Recov. factor, oil main phase [fraction] (0.00-1.00) | 0.22 | 0.40 | 0.65 | | | | | | |
| Recov. factor, gas ass. phase [fraction] (0.00-1.00) | 0.22 | 0.40 | 0.65 | | | | | | |
| 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) | 90 | | | 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) | 250 | | | Dato: | NPD will insert value | Registrert Dato: | NPD will insert value | Kart dato | NPD will insert value |
| Cut off criteria for N/G calculation | NA | NA | NA | | | | | Kart nr | NPD will insert value |

# 5 TECHNICAL ASSESSMENT

A technical evaluation was performed addressing different development scenarios in case of a Fat Canyon discovery in 2021. The base case development plan for a P50 oil discovery was a stand-alone development with subsea templates hosting 6 production wells and 4 water injection wells. In addition, the development plan included 1 satellite injection well for the solution gas (Fig. 5.1 ). A tie-back to Njord case was also worked up for reference. The subsea part in terms of templates and development wells is the same as for the base case but without a gas injection well. The gas would in the tie-back case be sent comingled with the oil to Njord for further processing.

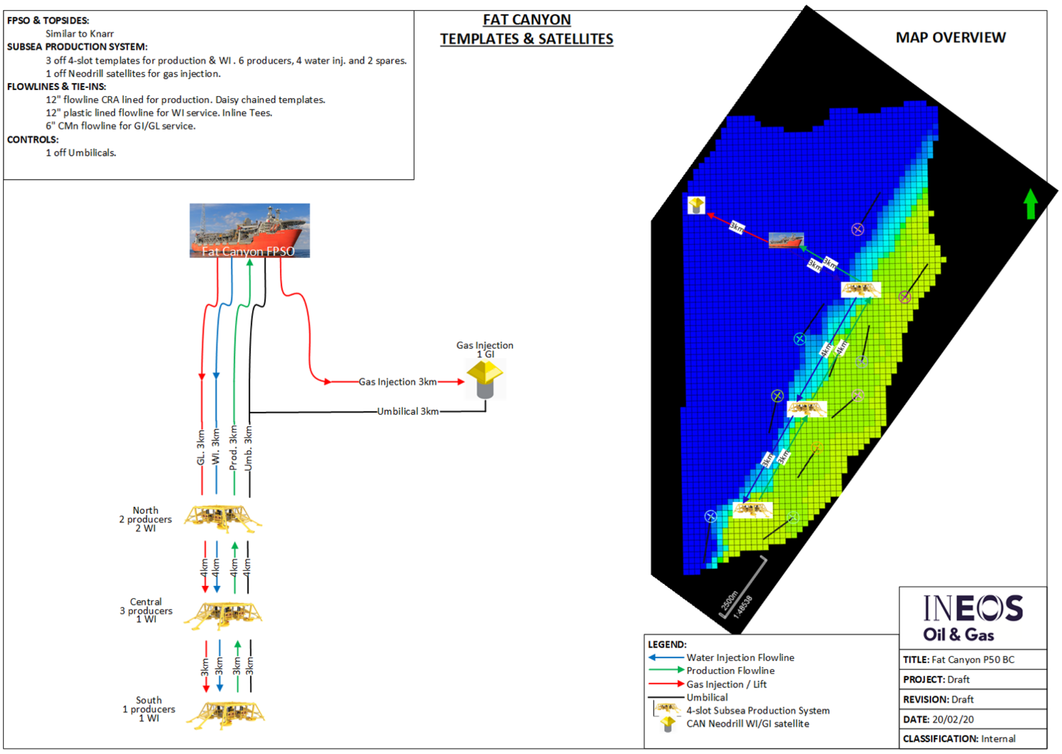


**Fig. 5.1 Fat Canyon Development Scenario**

*The development plan for the P50 consisted of a stand-alone development with FPSO templates consisting of six producers and four water injectors.*

# 6 CONCLUSION

Phase 1 of the work programme leading up to the drill or drop decision has been fulfilled by licensing and PSpro-conditioning of the DG13001 3D seismic survey and conducting G&G studies in the license. Nevertheless, the partnership applied for, and was granted, a one-year extension, during which the PGS17M05INER19 (PSpro) was used and the Fat Canyon prospect re-evaluated. This led to maturing the Fat Canyon Prospect to a drill decision in 2020 and drilling of the 6306/3-1 S and 6306/3-1 ST2 wells in 2021, thereby fulfilling Phase 2 of the work programme.

Based on the well result, post-well analysis and the lack of other prospects within the license, the license partnership have unanimously taken a decision to drop the license at the BoK milestone.