

# PL 406 Mackerel & Herring Drop Decision

## Licence Relinquishment Report

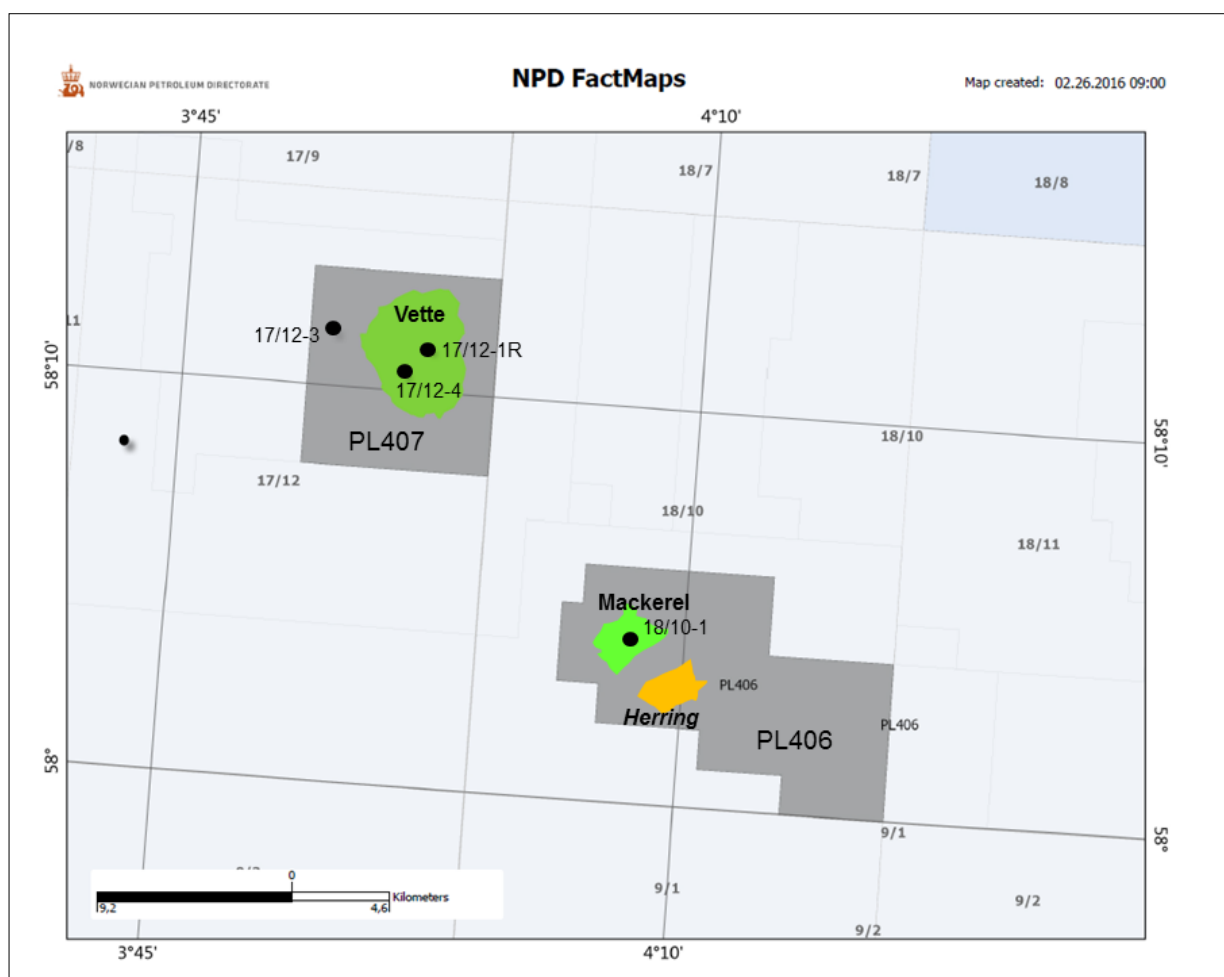
### Index

<b>1</b>	<b>KEY LICENCE HISTORY .....</b>	<b>2</b>
1.1	PL 407 VETTE .....	3
1.2	PL 406 MACKEREL AND HERRING .....	4
<b>2</b>	<b>DATABASE .....</b>	<b>5</b>
<b>3</b>	<b>REVIEW OF GEOLOGICAL FRAMEWORK .....</b>	<b>6</b>
3.1	PL 407 VETTE .....	7
3.2	PL 406 MACKEREL .....	8
<b>4</b>	<b>PROSPECT UPDATE .....</b>	<b>9</b>
4.1	PL 406 HERRING .....	9
<b>5</b>	<b>TECHNICAL EVALUATION .....</b>	<b>11</b>
5.1	PL407 VETTE .....	11
<b>6</b>	<b>CONCLUSION .....</b>	<b>12</b>

# 1 Key Licence history

Reference is made to the “Agreement regarding Co-Ordination of Petroleum Activities in Production Licences PL 406 and PL 407” effective as of 1<sup>st</sup> January 2015. Art. 2.3 in said agreement clearly states the management of the joint activities related to the licence coordination area shall be conducted as if the production licences 406 and 407 were one production licence.

There has been no consensus in the PL406 and PL 407 licence to relinquish the licenses. As there is a drop decision within 16.08.16 for PL406, it is proposed to drop the PL 406 licence as there is no plans to go further with Vette Field in the PL 407 licence.



**Figure 1: Current licence area for PL 406 and PL 407 with the Vette and Mackerel discoveries and the Herring Prospect highlighted.**

Licence	Discovery	Prospect
PL 406	Mackerel	Herring

**Table 1: Discoveries and prospects within the PL 406 licences.**

## 1.1 PL 406 Mackerel and Herring

The exploration well 18/10-1 in PL 008 was drilled in December 1979 by Elf Petroleum Norge AS and proved oil in Mackerel. However, a development was not seen to be economical and the license was relinquished. PL 406 was awarded on the 16<sup>th</sup> February 2007 with Premier Oil Norge as operator. The licence exploration well 9/1-1 S was drilled in November 2011 but proved to be dry and was followed by a partial area relinquishment in February 2013. The licence currently has an area of 115 km<sup>2</sup> covering part of block 18/10.

PL 406 work programme at award consisted of:

- 3D seismic acquisition within 16.02.2012 - MC3D-EGB2005 purchased May 2007;
- 1 well drilled within 16.02.2012 – Well 9/1-1S (Gardrofa) completed November 2011;
- Reprocessing and analysis of seismic data within 16.08.2016 - Sharp Reflections Study completed Feb 2015;
- Decision to drill well on Herring prospect or drop decision within 16.08.16;
- End of initial period 16.02.2017;
- Relinquishment rapport within 16.05.2017.

Since PL 406 licence award, a number of extensions to the initial periods and changes in ownership have occurred. The most recent changes occurred with Det norske oljeselskap ASA purchase of Premier Oil Norge AS and became operator for both licences.

The joint venture partner interests in PL 406 are currently:

<b>Company</b>	<b>Interest</b>
Det norske oljeselskap ASA (operator)	50%
KUFPEC Norway AS	30%
Tullow Oil (Bream) Norge AS	20%

## 2 Database

### Wells:

17/12-1R Vette discovery well (PL 407)

17/12-3, 17/12-4, 17/12-4 A, 17/12-4 B Vette appraisal wells (PL 407)

17/12-2 Brisling discovery well (now Open Area)

18/10-1 Mackerel discovery well (PL 406)

8/3-1, 8/3-2, 9/2-1, 9/2-2, 9/2-3, 9/3-2, 17/9-1, 17/11-1, 17/11-2, 17/12-2, 17/12-3, 18/11-1

### Seismic:

Survey	2D Lines/3D Coverage
MC3D-EGBRM13 PSDM	area of PL 407 and part area of PL 406
MC3D-EGB2005	Full survey extent towards the NW plus 3°44'40"E, 58°03'20"N 4°09'30"E, 58°03'20"N 4°09'30"E, 58°12'00"N
NS	Lines: 04, 05, 06, 10, 11, 21, 22a, 23, 26, 26a, 27a, 28, 29a, 30, 30a, 31
ST 8107	Lines: 128, 132, 136, 140, 356, 360, 364, 368
81M	Lines: 03-7D, 58-10D, 58-12D, 58-14D, 58-110D

### 3 Review of geological framework

The overall geological framework remains unchanged since the licence award. The new wells have supported the common geological models and most likely have demonstrated the lateral depositional extension of the main Bryne reservoir zone (B2) over the PL 407 and PL 406 areas.

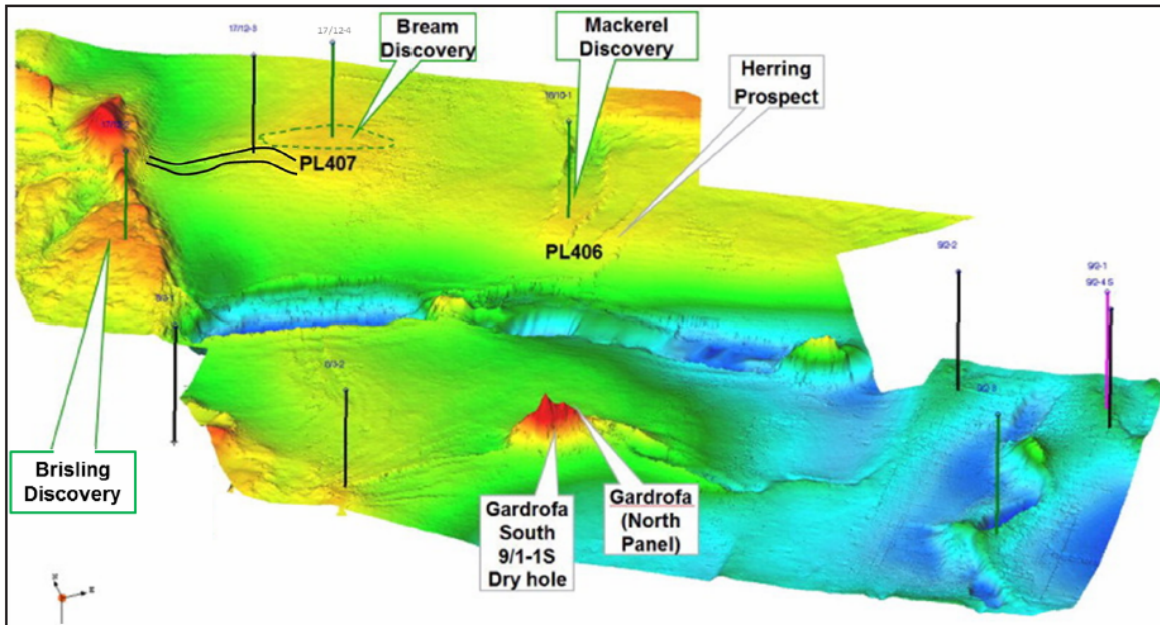


Figure 2: Bream (now Vette) area overview. Top Bryne Fm. depth map showing hydrocarbon accumulations, faults and local structure outline

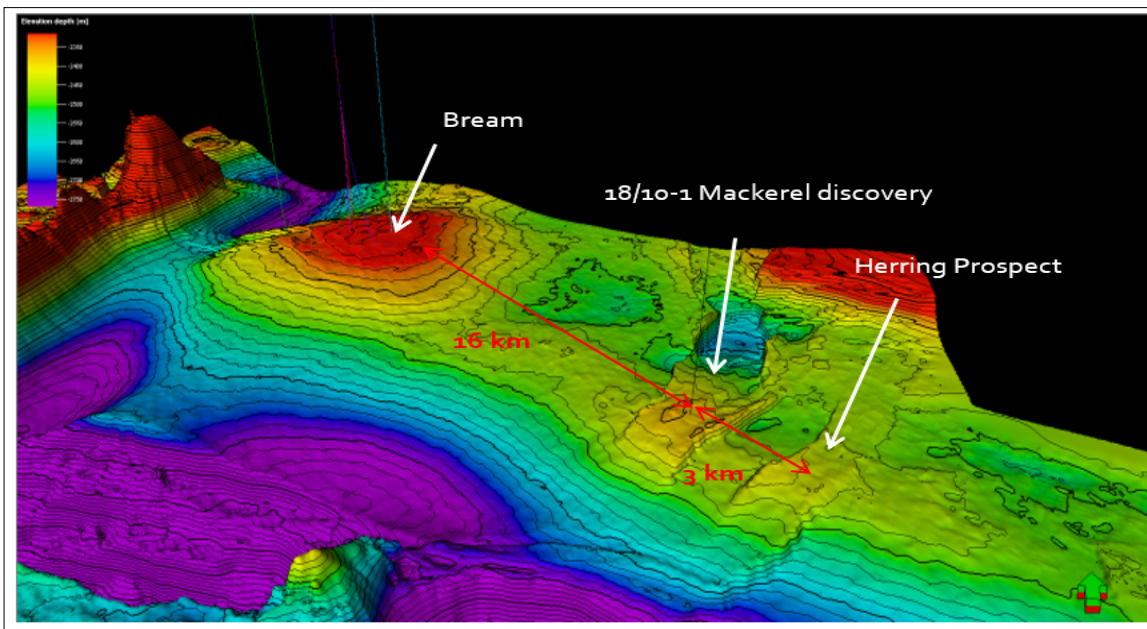


Figure 3: Top Bryne depth map showing the Bream (now Vette) and Mackerel discoveries and the Herring Prospect. The proposal was to tie Mackerel and a potential Herring discovery into a Vette field development.

### 3.1 PL 406 Mackerel

The Mackerel (18/10-1) discovery comprises stacked fluvial channel sands of Middle Jurassic age (Bryne Fm.). On the basis of observations from log and seismic data the oil bearing interval can be broadly subdivided in two discrete Bryne Fm. Zones, Upper Member (B1) and Lower Member (B2 + B3).

Pressure data (RFT, XPT) indicate separation of the Upper and Lower intervals which is consistent with the increased potential for isolation with decreasing channel size and frequency. Between offset wells significant (>25 psi) differences between pressure trends suggests lateral as well as vertical separation.

The OWC is interpreted to be 2412 mTVDSS, defined by the abrupt decrease in saturations observed in core and calculated from logs. It should be noted that the potential for compartmentalisation and changes in rock quality adjacent to the contact (size of transition zone) have the potential to move the contact (up or down) away from the well control. This is significant since minor changes (+/->2m) have a measurable impact on the GRV and resultant resource estimate.

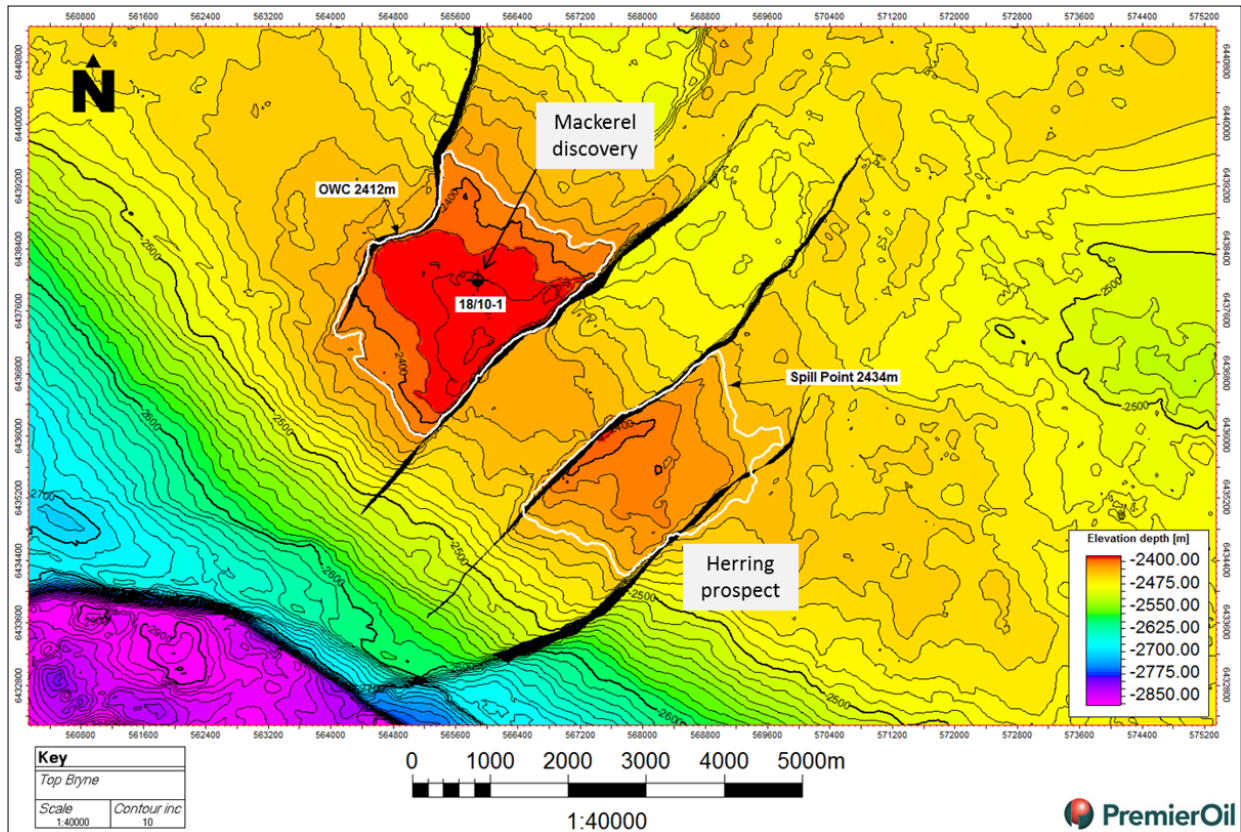
Mackerel	P90	P50	P10	Mean
STOIIP (mmbbls)	15.3	20.2	26.8	20.7

**Table 2 – Mackerel summary of estimated in-place oil volumes (mmbbls STOIIP)**

## 4 Prospect update

### 4.1 PL 406 Herring

Herring is the adjacent closure to the south east of Mackerel. The structural configuration is similar, Herring has a central horst block, like Mackerel, but the ultimate structural spill is limited by the NE tip of only the western bounding fault. This larger 3-way fault closure covers a larger but low relief area. The low relief of this larger area results in little additional contribution to the in-place volumes since it comprises mostly the Upper Member poorer reservoir.



**Figure 4: Top Bryne depth map with Mackerel discovery and Herring Prospect highlighted.**

Model inputs for Herring are similar to Mackerel. However, there is a greater uncertainty in GRV. A range of column heights has been constructed relative to the interpreted fault seal capacity and ultimate structural spill point of each map – this assumes Mackerel is charged via Herring and fault seal is effective at least to the point of self-juxtaposition of the Top Bryne.

Herring STOIP (mmbbls)	P90	P50	P10	Mean
Upper Mb.	0.9	3.1	10.5	4.7
Lower Mb.	6.7	27.7	54.2	30.1

**Table 3 – Herring summary of in-place oil volumes (mmbbs STOIP).**

The probability of geological success is 63%. Charge is interpreted to be the key risk associated with the Herring structure. Modelling exercises suggest that Herring will most likely receive charge if there are source rocks present in the adjacent kitchen to the south, irrespective of spill to Mackerel or not.

There is a small risk on the reservoir effectiveness and the low relief of the Herring structure can result in a greater proportion of the Upper Member reservoirs being the hydrocarbon zone which are typically thinner and of poorer quality.

There are no other prospects in the licence.

## **5 Technical evaluation**

Given the resources in the licence, there is no basis for a stand-alone development in PL 406. Currently there are no fields that could be a possible tie-in host for the discovery and prospect in the PL 406 licence given the deadlines in the licence.

## **6 Conclusion**

There is a drop decision within 16.08.16. It is recommended to drop the PL 406 licence as no well is planned.