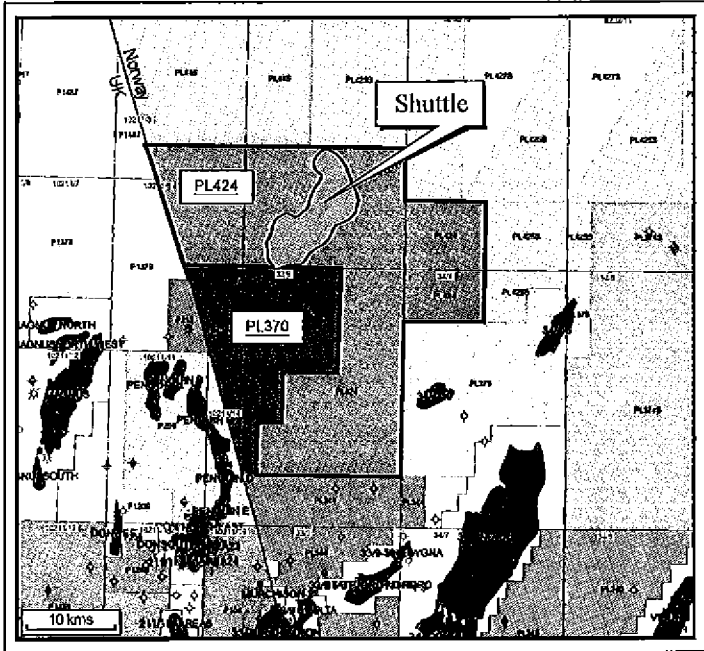
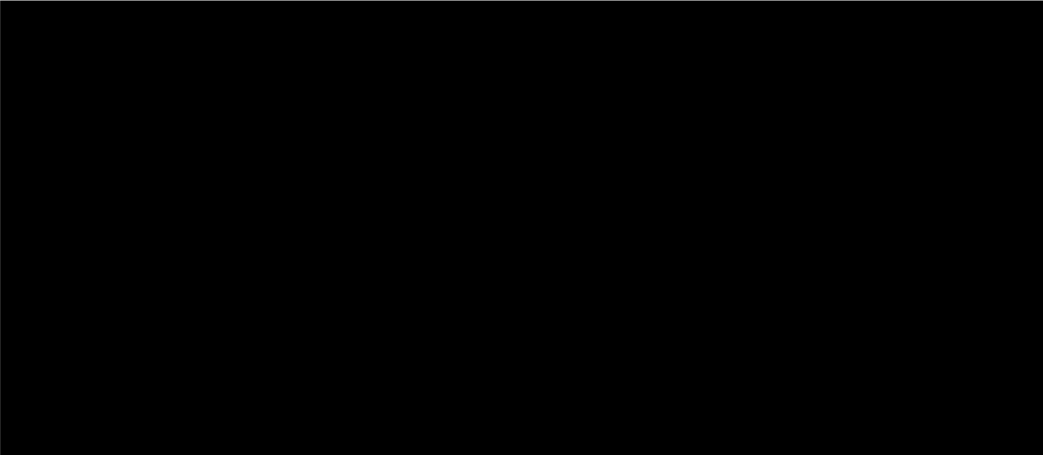


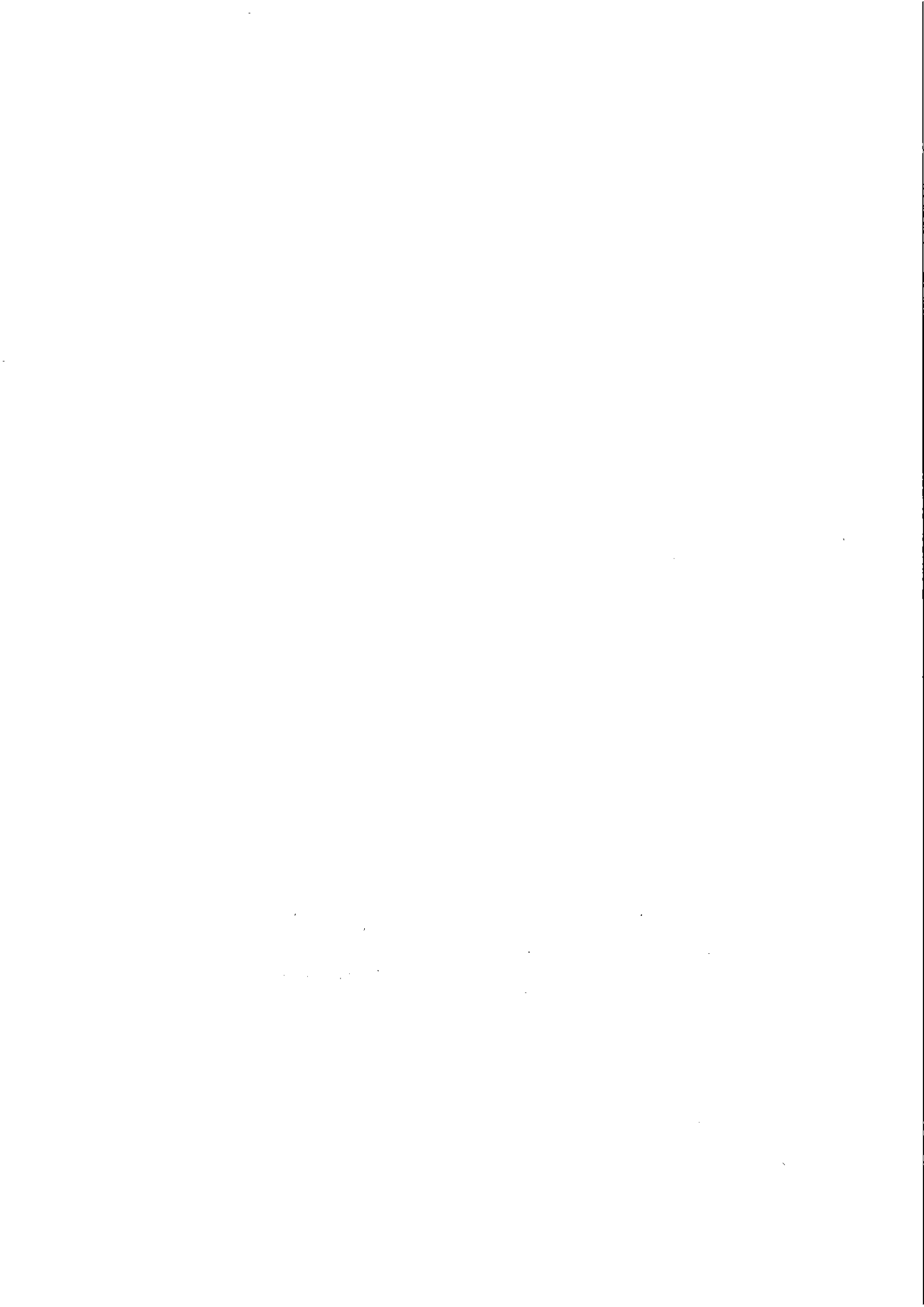
# PL424 License Relinquishment Report



May 2012



Phillips



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## 1 Summary and Conclusion

PL424 was situated in the Magnus Marulk basin in Norwegian waters. The license was covering parts of blocks 33/2, 33/3, 33/6, 34/1 and 34/4. The license was awarded 16 February 2007, and had a drill or drop decision date of 16 February 2009. The main play in PL424 is the Lower Cretaceous turbidite sands, with the underlying Upper Jurassic being the primary source rock. Interbedded and overlying shales provide the necessary seal. The primary Upper Jurassic Play prospect identified in the northern part of block 33/2, which was part of the application, was not included in the award.

This report summarises the work done in 2007-2009, after the license was awarded. The main elements of updates on the license have been merging, reprocessing and inversion of all of the existing 3D seismic surveys, seismic attribute/amplitude expectation modeling, integration into the regional framework with interpretation of regional NSR 2D long offset seismic, re-interpretation of older vinrages seismic, depth conversion analysis, basin modelling and volume calculations.

Merging, reprocessing and inversion of the 3D datasets took longer than originally anticipated and a six month extension for the drill drop decision for the PL424 license was granted with a new decision point of 16 August 2009. Should a drill decision have been made, the license would have expired 16 February 2012.

The work program was aimed at reducing the primary risk of the presence of reservoir quality sands in the objective section. While the risk for finding sand was reduced as a result of the work, unfortunately, the magnitude was not deemed sufficient to increase the confidence in finding a well developed, massive reservoir that would be required for an economic development. This, combined with the high risk nature of the stratigraphic pinchout of the prospect, the risk for the prospectivity in the PL424 license was considered to be too high to pursue further and the partnership, therefore, decided to fully relinquish the license.

## 2 Key License History

The initial application for this license was submitted in 2006 jointly by ConocoPhillips (operator) and Faroe Petroleum. The 2007 award, however, included the participation of PetroCanada and Revus, but excluded the primary Upper Jurassic prospect in the northern part of block 33/2 and the work program was modified accordingly.

The revised initial work obligations were to:

- a) reprocess the existing 3D seismic, and
- b) to perform geological and geophysical studies of the area,

in order to make a drill or drop decision within the primary term of the award.

A six month extension to complete the evaluation was granted on 26 June 2008 and following results of the integrated evaluation and prior to the new decision date of 16 August 2009 , the decision was taken by the PL424 partnership to fully relinquish the license with no further seismic or well activity.

## 3 Database

### 3.1 Well database

The original well database over the area is detailed in the 2006 APA application document. No new relevant wells were drilled in the vicinity of the license during the course of exploration period.

### 3.2 Seismic data

The original seismic database over the area is detailed in the 2006 APA application document. The license was covered by 2D and 3D seismic data as illustrated in Figure 3.1.

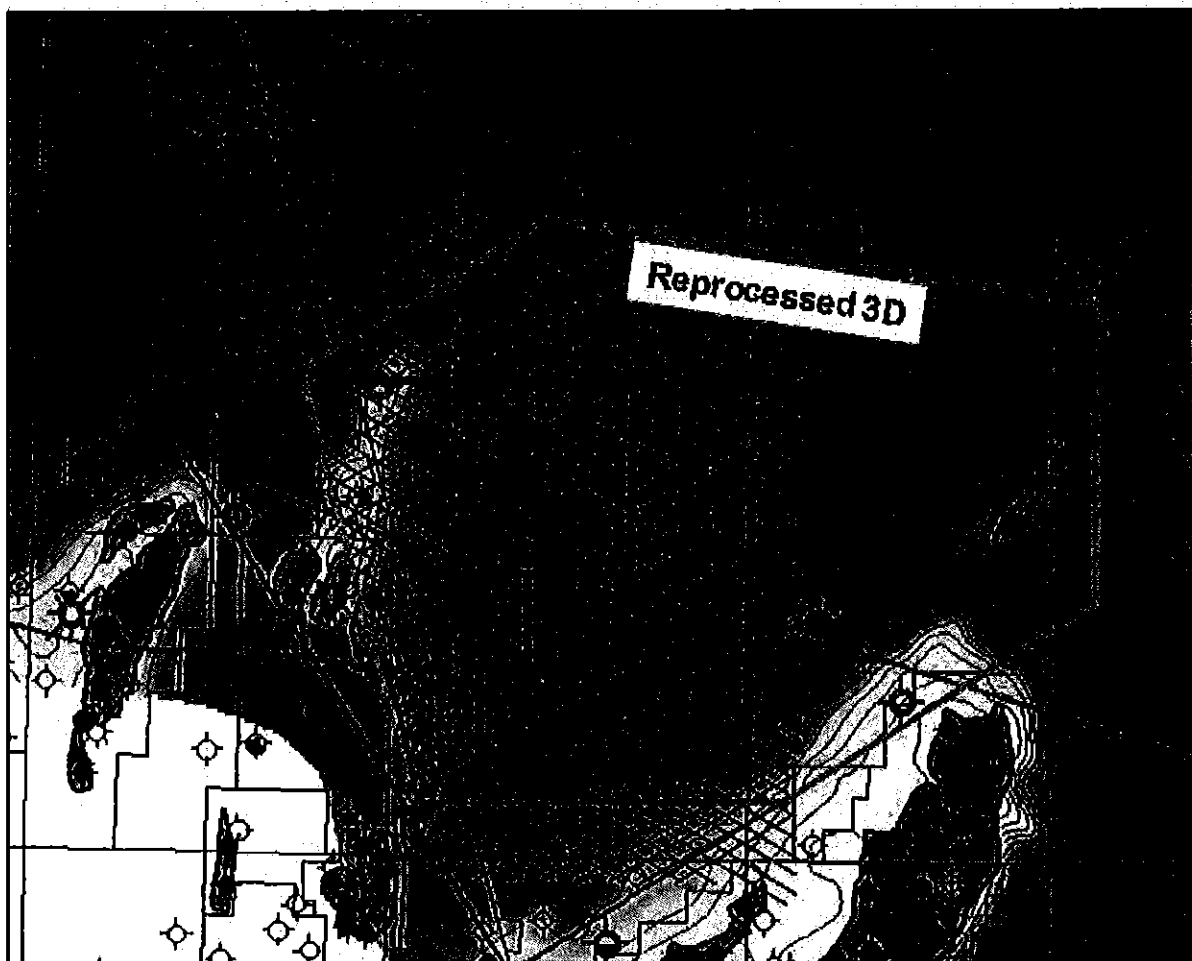


Figure 3.1 PL 424 seismic database map (background bathymetric map)

## 4 Review of Geological Framework

### 4.1 Lower Cretaceous Stratigraphy

The geological framework section summarizes the changes in understanding of the Lower Cretaceous system from that presented in the license application. These changes are due to the revised interpretation on the reprocessed seismic and the forward modeling of the seismic expectations, which failed to de-risk the presence of massive reservoir quality sands. The Upper Jurassic prospect, which formed the primary basis for the original application, was not included in the award and is, therefore, not discussed further. The stratigraphic and tectonic history of the Magnus Marulk Basin, which sets the regional context for the Lower Cretaceous Play can be found in the 2006 APA Application document.

The Lower Cretaceous Play of the Magnus Marulk Basin comprises the Agat Sandstone Formation of the Rødby Group, deepwater turbidite reservoir sands sourced by hydrocarbons expelled from the underlying Upper Jurassic organic-rich shales. The sands are interbedded within a massive shale dominated Lower to Upper Cretaceous section, which provides an effective top seal and in many cases side seal.

Stratigraphic trapping mechanisms, similar to those seen in ConocoPhillips UK Britannia Field (Figure 4.1) were invoked, in order to define one prospect and six leads identified for the Lower Cretaceous Play within the PL424 area.

Specific elements of the play are discussed in detail in the following sections.



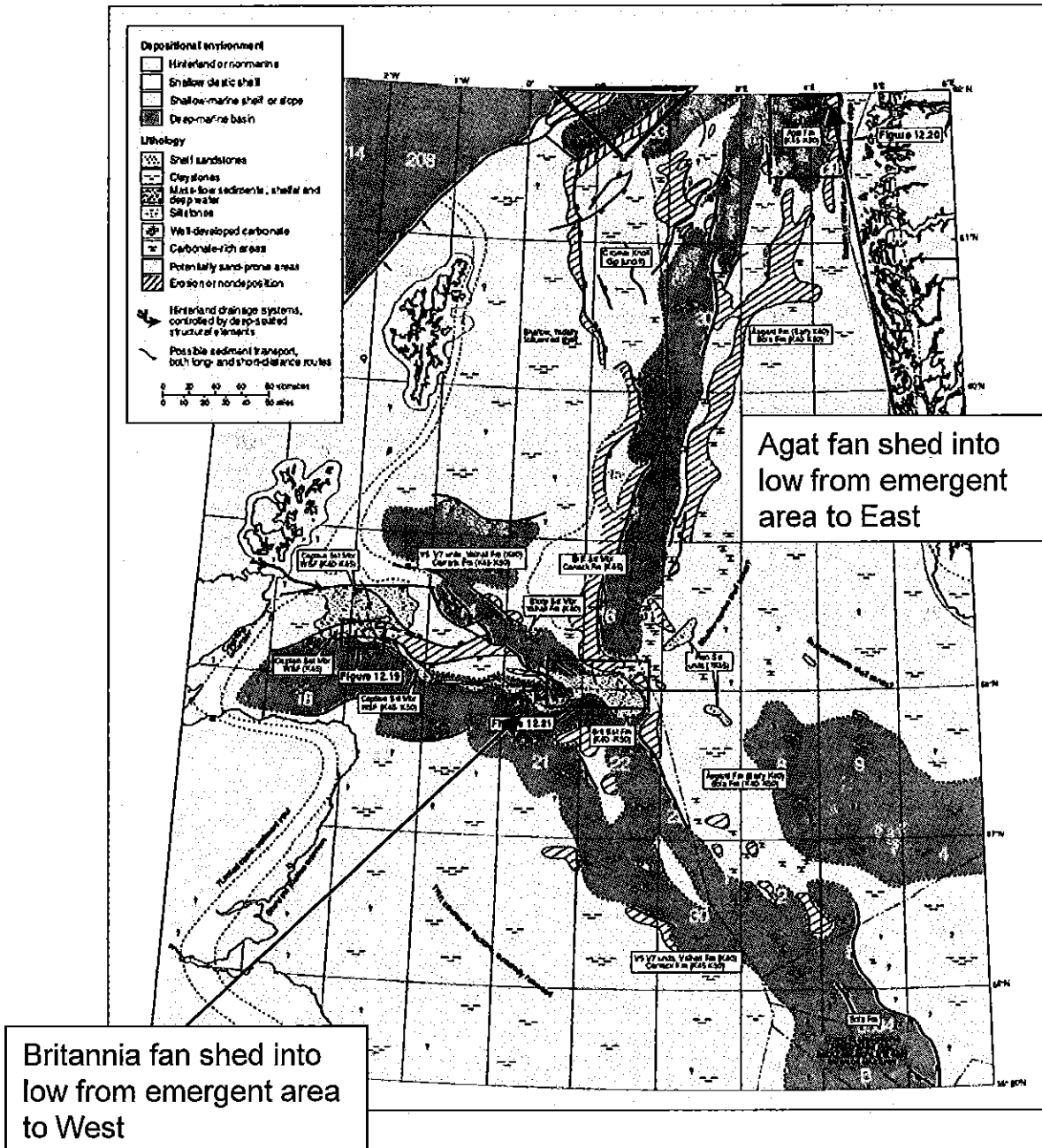


Figure 4.1 Lower Cretaceous Play. PL424 is located in the area outlined by the red triangle at the top of the map.

### 4.2 Reservoir presence and quality

The analogous UK Britannia reservoir is an Early Cretaceous sandstone deposited in the Witch Ground Graben and was considered to be a reasonable analogue for the prospect reservoir, since it was deposited in a similar tectonic setting, at similar depths and in a deep-water environment. The Britannia reservoir has good to moderate reservoir properties, and contains sandstones which are up to 200m thick. The sandstones range in net to gross from 40 to 60 percent in the main part of the reservoir while the fringe of the reservoir is characterized by lower reservoir properties.

The Agat system occurs over a similar depth range, as that proposed for the prospect and has maintained quite good reservoir properties with up to 20 percent porosity and permeabilities that range between 200 and 400 mD.

### **4.3 Mapping updates**

The trap is a stratigraphic trap that is formed by the depositional pinchout of reservoir quality sandstones. The sediments were deposited by turbidity currents, which flowed down the centre of the basin. The reprocessed seismic data confirmed the conceptual feasibility of a high risk stratigraphic trap, however, the pre stack inversion products failed to give indications of well developed reservoir presence, unlike that seen in the UK Britannia Field and predicted by the license specific modelling.

### **4.4 Source Rocks and Hydrocarbon Migration**

The organic rich mudstones of the Draupne Formation are considered the primary source rocks for the prospect with a supplementary charge provided by the Heather Formation. Basin modelling results indicate the most likely hydrocarbon type to fill the trap will be oil. Relatively light oils are predicted, which is consistent with data from offset wells. Migration of oil into the trap would have occurred as early as Late Cretaceous times.

## 5 Prospect Updates

### 5.1 Trap

The Lower Cretaceous Play concept is illustrated in Figure 5.1 and consists of stratigraphic pinchouts of prognosed reservoirs downdip of well 33/5-2, which contained no sand at any level in the Lower Cretaceous interval. The most prominent pinchout wedge, which formed the primary objective for the Shuttle Prospect, is of Albian age, the same level as the gas condensate Agat discovery in block 35/3 to the east. The trap consists of a complicated stratigraphic pinchout to the NW, SW and SE, with dip closure to the NE.

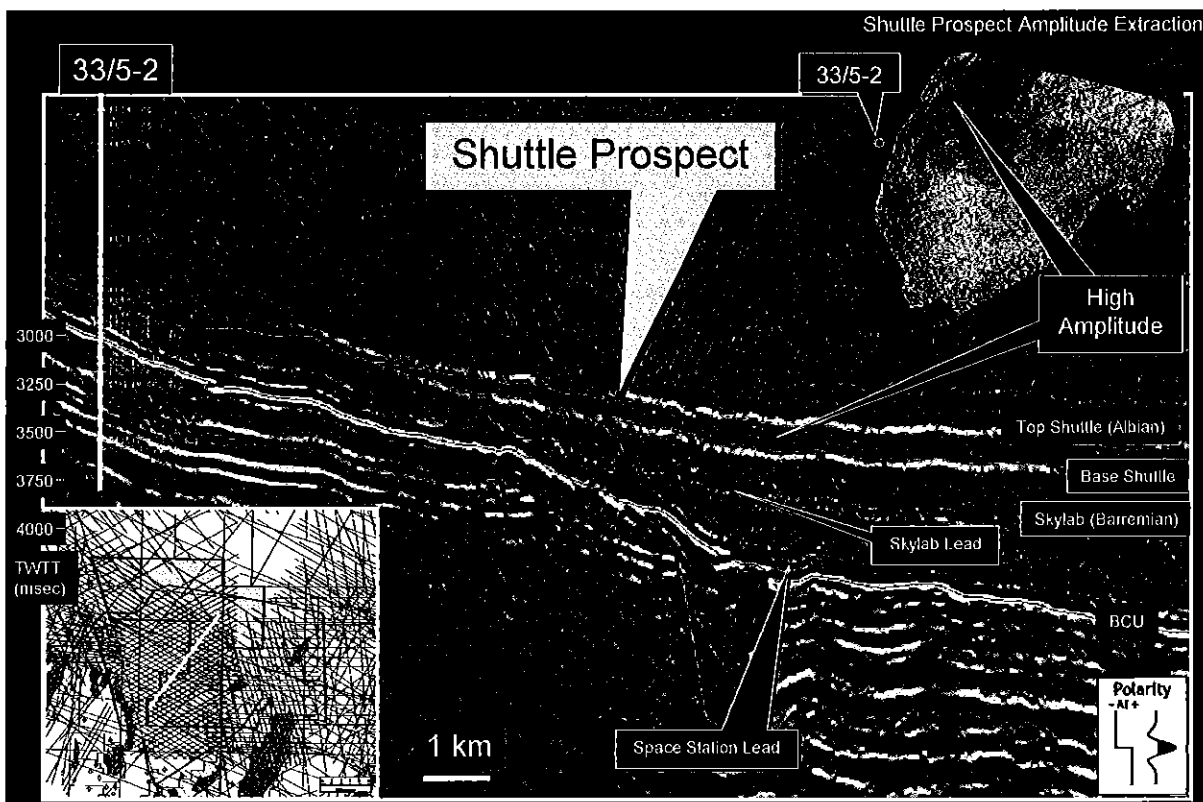


Figure 5.1 PL424 Lower Cretaceous Play Concept

Despite the use of extensive 3D visualization techniques (Figure 5.2), structure mapping Figure 5.3, isopach mapping (Figure 5.4) and analyses of the various pre-stack inversion products (Figure 5.5)

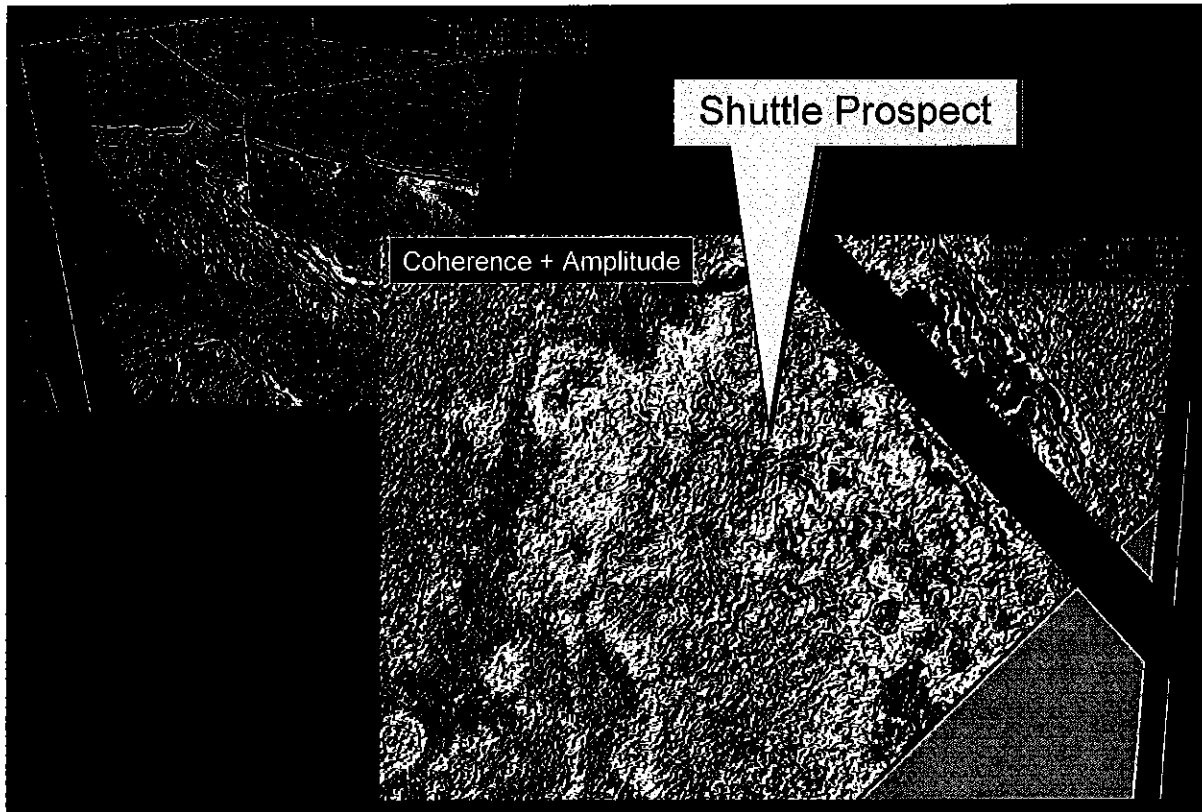


Figure 5.2 PL424 Shuttle Prospect 3D visualization with amplitude and coherence extractions

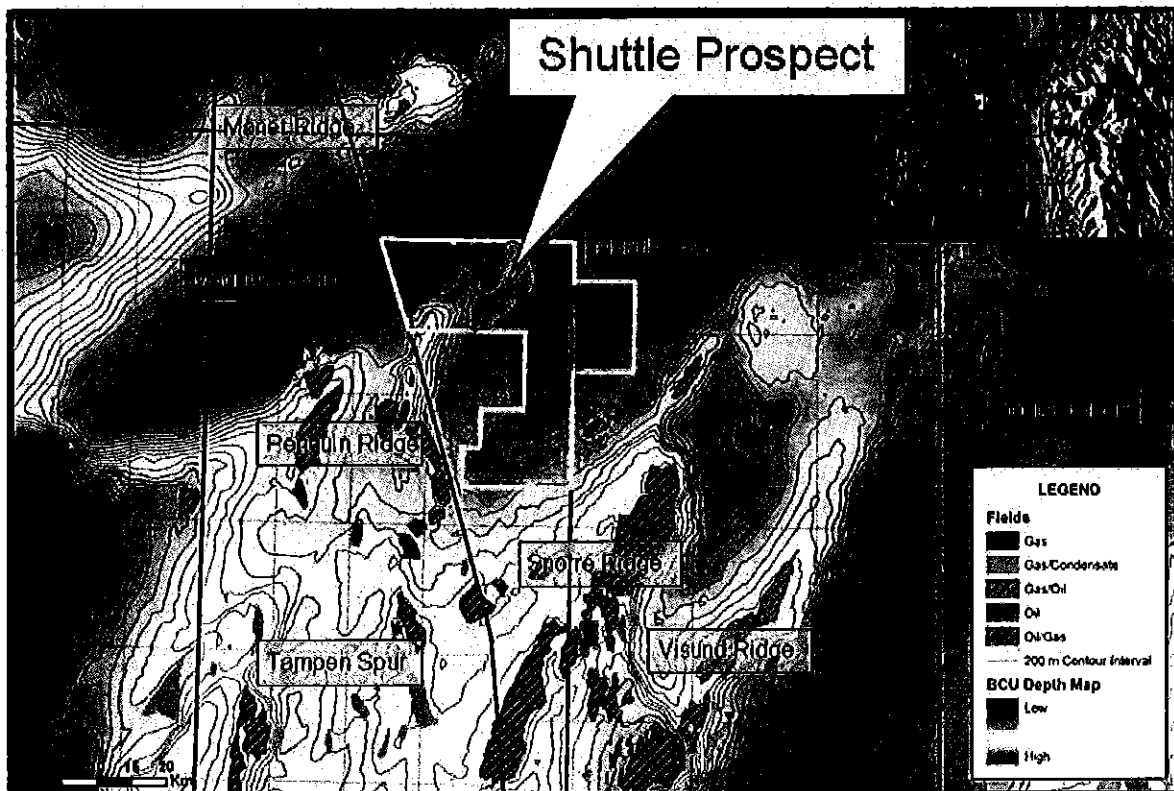


Figure 5.3 PL424 Base Cretaceous Unconformity Depth Structure Map

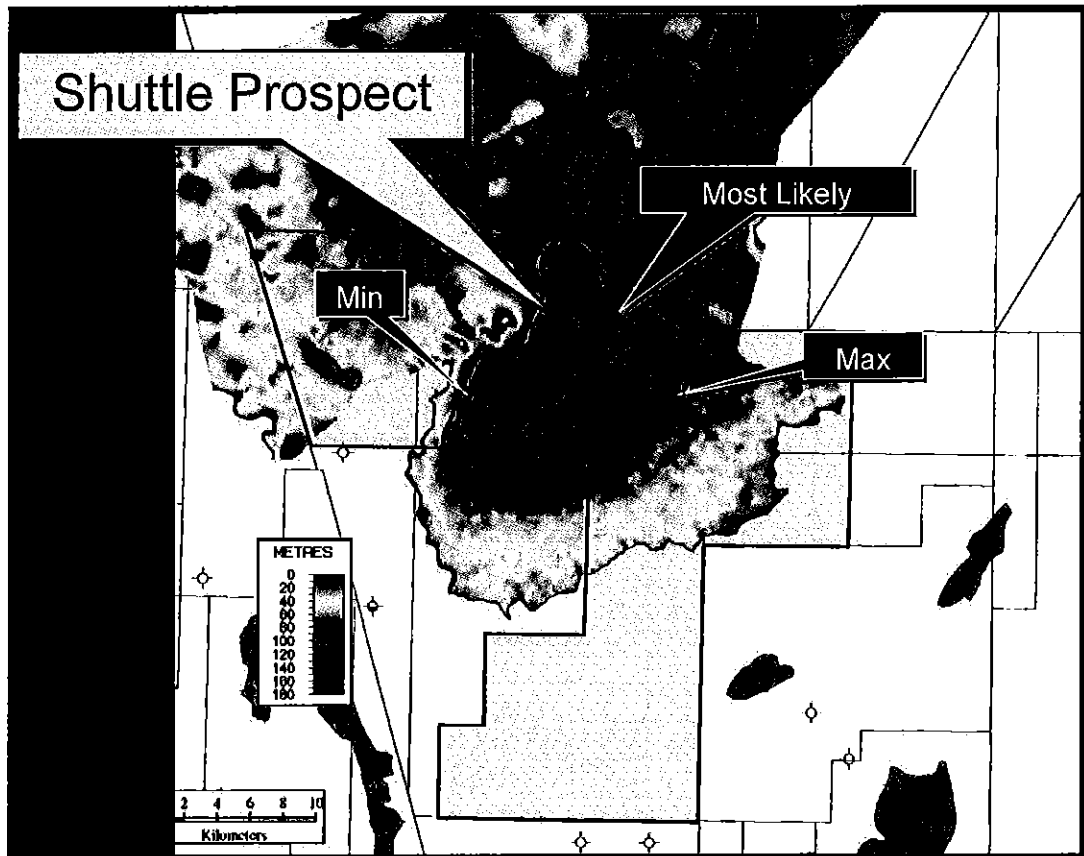


Figure 5.4 PL424 Shuttle Prospect Isopach Map

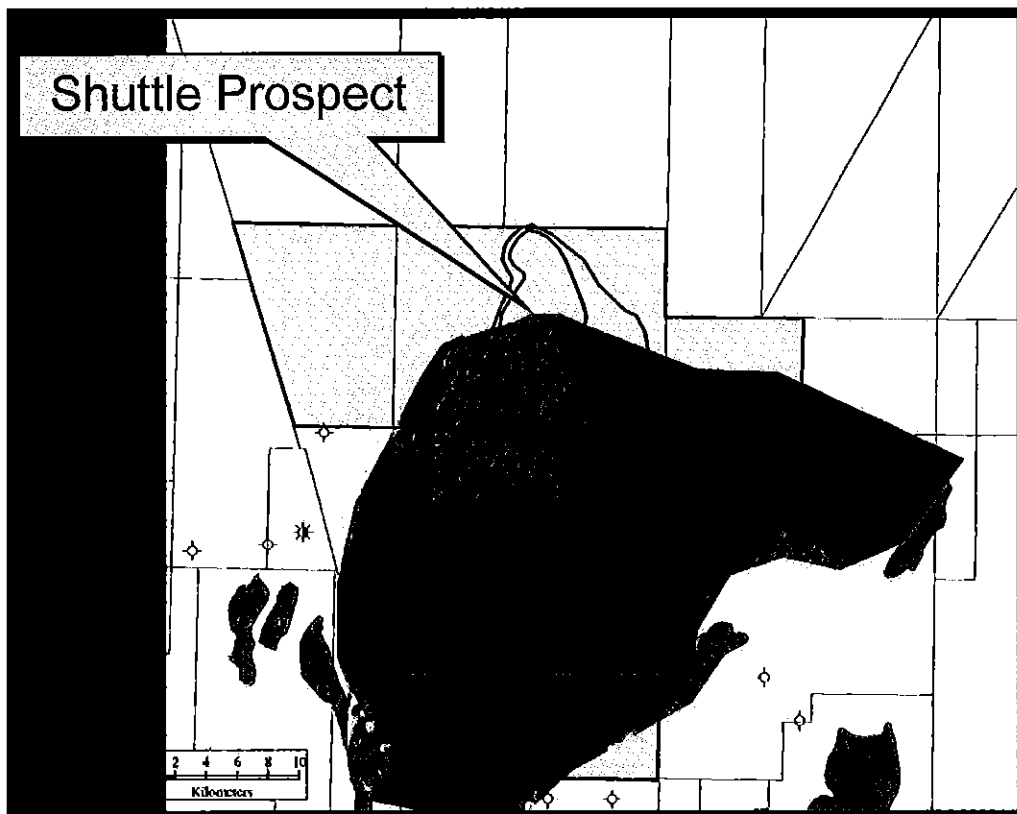


Figure 5.5 PL424 Shuttle Prospect RMS Amplitude Extraction

## 5.2 Volumes

Volume calculations made with the results of the interpretation of the reprocessed seismic data are illustrated in Figure 5.6

Block	Operator name	Prospect description	Prospect ID (or New!)	NPD approved?
33/3	Shuttle	Prospect	<i>NPD will insert data</i>	<i>NPD will insert data</i>
Play (name/new)	Magnus Marulk Basin	ConocoPhillips		2012
Block area	31,9 km <sup>2</sup>			
Area of prospect	73,8 km <sup>2</sup>	131,7 km <sup>2</sup>		
Oil in place				
Gas in place				
Water in place				
Oil in place	9,2 km <sup>3</sup>	25,9 km <sup>3</sup>	54,8 km <sup>3</sup>	
Gas in place				
Water in place				
Water in place			P10	P90
Stratigraphic Pinchout	350	Lower Cretaceous (Albian)	Rødby Group, Agat Formation	
Upper Jurassic	Shale	Lower Cretaceous (Albian)	Shale	
2 D & 3D	0,19			
Probability of discovery	1			
Probability of discovery	0,41	0,58	1	0,79
Volume of oil in place	4120	4120	4120	
Volume of gas in place	56,5	56,5	56,5	
Volume of water in place	18	90	144	
Volume of oil in place	360	360	360	
Volume of gas in place	2539	2539	2539	
Volume of water in place	0,05	0,25	0,45	
Volume of oil in place	0,1	0,15	0,18	
Volume of gas in place	0,25	0,3	0,5	
Volume of water in place	0,00319	0,00331	0,00343	
Volume of oil in place	0,53	0,62	0,70	
Volume of gas in place				
Volume of water in place				
Volume of oil in place	0,26	0,31	0,36	
Volume of gas in place	120	180	276	
Volume of water in place	156			611
For NPD use:				
Innrapp. av geolog.	Registrert	Map OK:	Nr.	
Dato:	Dato:	Dato:		

Figure 5.6 PL 424 Shuttle Prospect Reservoir Parameters and Volumetrics

### 5.3 Risking

The critical risk for the Shuttle Prospect is clearly defined as the presence of thick porous and permeable sands and both the geological and geophysical work programs were designed to increase confidence in the presence of a well developed effective reservoir.

## **6 References**

ConocoPhillips (2006) Awards in Predefined areas 2006, Blocks 33/2, 33/3, 33/6, 34/1 and 34/4

Six month extension: The Royal Ministry of Petroleum and Energy - 08/02706-4