

RELINQUISHMENT REPORT

1. Licence Information

Licence Number : PEDL 150 (blocks 86, 87 & 96) License Round : 12th Licence Round Licence Type : Landward Production Licence (PEDL). The initial term is 6 years starting from 1st October 2004, currently in the second Term, which is a 5 year term and required a 50% area relinquishment. Block Numbers: SK86c, SK86d, SK87b, SK96b. Operator : Europa Oil & Gas (Holdings) plc. (100% equity interest) Partner : Europa 100%

DECC is free to publish this report after the 14th Licence Round, 28th October 2014. Europa Oil & Gas as operator has not cleared this for publication until after the closing date for the 14th Licence Round.

2. Licence Synopsis

Blocks SK 86, 87 and 96 were acquired by Europa Oil & Gas Limited (100% operator) on 1st October 2004 as part of the 12th Licencing Round. Shortly afterwards the licence was farmed down to Valhalla Oil & Gas Limited (25 %). The initial licence term was for 6 years. The work programme consisted of a firm commitment to obtain 50km of released 2D within a year and a contingent commitment to obtain 30km of new proprietary 2D. A drill or drop decision would be taken by the end of the third year anniversary of the award date. There was a firm commitment to conduct a 50km² Gore-Sorber geochemical survey in year 1 and to assess geochemical signatures of the identified leads. The survey was to be calibrated against known dry holes, non-commercial and commercial hydrocarbon wells. On the relinquishment of 50% of the Licence Block area, the Licence was extended for a further 5 years after the initial 6 year term and had no firm work programme requirement. See **Figure 1**. Valhalla withdrew from the Licence making Europa Oil & Gas officially hold 100% from 11th March 2014.

50 km of proprietary 2D was shot in 2007 and 87km of existing 2D was reprocessed in 2007. The Hykeham 1, 1z well was drilled to test the Gravel Pitts prospect in 2010. The objective was to evaluate the Upper Carboniferous for hydrocarbon accumulations.

The block lies south of the Gainsborough Trough and surrounds the Whisby Production Licence. There are nearby mature established fields producing from the Carboniferous. The investigations were designed to evaluate combined structural and stratigraphic trapping potential in the Upper Carboniferous sequence on and around the Whisby-Bassingham High in the East Midlands Basin. Four main exploration leads existed at the time of the original application. The leads presented in the original application were named Doddington, Doddington North, Haddington and Gravel Pits. They all lie in a NW-SE arc running approximately 10km SW of the city of Lincoln. A lead called Caledonian Farm West is also mentioned and is a stratigraphic play.

In order to identify undrilled prospectivity in the area, Europa has used proprietary, released well and seismic data, along with background materials from the DECC onshore released report database to identify several exploration leads in the Late Carboniferous sequence. In the Application Area, the potential exists for small structural closures within the lower part of the Westphalian section of the Upper Carboniferous sequence, and this was augmented by evidence for stratigraphic trapping in individual sand groups such as the Loxley Edge Sandstone.



Figure 1. The Yellow area is the reduced PEDL150 area following the relinquishment of 50% of the acreage (outlined in red) in October 2010.

3. Work Programme Summary

The licence commitment required the group to acquire 20Kms of new 2-D seismic data and to reprocess 51Kms of existing 2D seismic. The group reprocessed a total of 95.9Kms of 2D and approval was granted to transfer the 20Kms of 2D commitment to blocks PEDL 180/181. This 2D seismic survey over PEDL 180 was conducted in Q1 2012 at the same time as the 3D of 40 square km shot over the Broughton prospect.

Drill a contingent well of depth greater than 1500m to test the section or to allow the Licence to cease on 30th June 2011.

To date, the work conducted on the block comprises:

- 1. Review and preliminary interpretation of all data including well and existing 2-D seismic surveys.
- 2. Geochemical survey, 47.5 sq. km.
- 3. Seismic reprocessing of some 86 Kms of 2D seismic
- 4. Seismic acquisition of 48.98km of new 2D seismic.
- 5. Seismic interpretation and depth conversion of same.
- 6. Drilling Hykeham 1, 1z well.

A subset of existing 2D lines, some 86km	, were reprocessed in 2007 by	y Europa/Valhalla using Spectrum.
--	-------------------------------	-----------------------------------

<u>Line</u>	CDP Range	Length (km)
BP-83-81	109 - 674	7
BP-84-39	87 – 872	24
BP-84-45	116 – 795	14
BP-84-52	10 - 576	7
BP-84-54	5 – 337	4

BP-84-157	2 – 452	5.6
BP85-54A	3 – 225	2.7
BP85-55	18 – 558	6.8
E86A-10	5 – 722	9
SUN85-019	6 – 478	5.9

Please see Figure 2. for a pre and post reprocessing example.



Figure 2. Line on the left is displayed with data prior to reprocessing in 2008, Line on the right shows the results of the 2008 reprocessing.

Europa Oil & Gas shot 49km of new 2D seismic in June 2007 see **Figure 3 & 4**. The field data was acquired by IMC Geophysical Ltd. The processing of the 2D was done by Spectrum.

LINE_	SP Range	Length (km)
EUR-07-01	101 – 496	9.9
EUR-07-02	101 – 375	6.88
EUR-07-03	101 - 380	7
EUR-07-04	101 – 350	6.25
EUR-07-05	101 – 388	7.2
EUR-07-06	101 – 570	11.75



Figure 3. 2D Lines acquired by Europa in 2007



Figure 4. EUR-07-06 example of 2D line shot in 2007

Europa Oil & Gas contracted W.L. Gore & Associates Inc. (GORE) to conduct a geochemical survey in 2005 shortly after obtaining the PEDL 150 licence. See section 6.

Hykeham Well

Europa Oil & Gas drilled the Hykeham 1 (L46/12-17) and Hykeham 1z (L46/22-17z) sidetrack well to test the Gravel Pitts prospect. See **Figure 5.** for the well location. The first well failed to find the stratigraphic tops at the prognosed depth forecast. A previously unseen fault was detected and so the drilling rig pulled back and sidetracked the well according to the revised mapping. See **Figure 7**.



Figure 5 Hykeham Well Location

The Hykeham 1z well had significant shows but was plugged and abandoned as a dry hole.

Wireline log computer processed interpretation suggested that there were some movable oil in place, see **Figure 6**, but extensive testing failed to obtain any production.





Figure 7. Hykeham 1 and 1z well depth vs time

A table containing the actual depth found for the top of the main formations is presented below. The sequence stratigraphy is as expected. However more structural effects are discovered for the Carboniferous.

Formation		MD (m)	TVD-GL (m)
	L46/22-17	Actual	Actual
Triassic Mudstones	ssic	-	-
Sherwood Sandstone	Tria	395	391.5
Upper Permian Marl	_	601	594.9
Upper Magnesian Limestone	ermiar	637	630.9
Mid Permian Marl	ă	652	645.9
Mansfield Marine Band		815	804.7
Clay Cross Marine Band		904	893.6
Tupton Rock	iferous	939	928.5
Top Caledonian Farm Sand	arboni	1,014	1,003.20
Top Basal Sandstone	U U	1,030	1,019.20
Carboniferous Limestone Member		1,033	1,022.10

Hykeham 1 L46/22-17 Geological Summary of Formation Tops

Hykeham 1 Sidetrack L46/22-17z Geological Summary

Formation		MD (m)	TVD-GL (m)
	L46/22-17z	Actual	Actual
Mid Permian Marl	ſ	-	-
Lower Magnesian Limestone	ermiaı	694	683.7
Base Permian	a a	763	751.4
Mansfield Marine Band		824	808.2
Clay Cross Marine Band	sno	929	896.5
Top Caledonian Farm Sand	onifer	1,058.50	999.4
Top Basal Sandstone	Carb	1,068.50	1,004.89
Carboniferous Limestone Member		1,077.50	1,014.50

4. Database

The lattice of 2D seismic lines available and used by Europa Oil & Gas in, and around, PEDL 150 are shown in **Figure 8**; also shown on this map are the wells (both released and proprietary) for which Europa had digital logs &/or images of the logs and reports.



Figure 8. PEDL 150 Well and Seismic Database

All the 2D public domain legacy seismic data available in PEDL 150 (1980 to 1986 vintage, shot and processed originally by BP, Sun and NCB) had been purchased/licensed by Europa Oil & gas. All of the 2D data was in the originally processed form, no regional reprocessing had been carried out to bring all of the various vintages of data to a common seismic datum or uniform modern standard. Most, but not all, of the seismic lines were available as migrated versions, some were only stacks. Europa reprocessed 87 Km of legacy data.

The data quality was generally adequate to good, although on a few lines the quality was poor, the fold of data appeared low and they could only be used to indicate the general form of the subsurface structure rather than what could be called a detailed interpretation; such lines were not interpreted when they lay close to, or were overlain by better quality lines.

There were also 6 proprietary 2D lines shot and processed by Europa in 2007 targeting the West Whisby and Hykeham structures.

The 2D seismic data were interpreted by Europa using a Kingdom 2D/3D workstation; the first part of the work-flow was to manually adjust (by DC shifting) each line in turn to as common a seismic reference datum as was possible. This initial variability in the seismic datum appears to be a legacy of the variability in when and which companies processed the data initially and (from experience in nearby areas) it can be expected that different statics models were used by different companies at different times; this too would add to the variability.

Well Data:

Eagle Moor 1	D'Arcy	
Pickworth Plot 1	NCB/BP	
Swinethorpe 1	NCB/BP	
Caledonian Farm 1	NCB/BP	
Whisby 1	BP	
Whisby 2	BP	
Whisby 3	BP	
Whisby 4	Blackland Park	
Black Cat 1	BP	
Aubourn 1	BP	
Hykeham 1, 1z	Europa Oil & Gas	2010

5. Prospectivity Update

The Doddington Lead (**Figure 9**) is a structure showing an element of dip closure on two orthogonal seismic lines at Base Westphalian and at intra-Westphalian levels. Originally estimated potential for oil in place for the Basal Sandstone and Loxley Edge units was in the order of 15mmbo, and included the upside potential of the Loxley Edge Sandstone with stratigraphic closure wrapping around the Whisby high. Further interpretation using the 2D seismic shot by Europa in 2007 has not firmed up this lead.

The Doddington North Lead (**Figure 9**) showed potential for structural closure at the Basal Sandstone and Tupton Rock levels and also by inference at Loxley Edge level. There is a moderate chance the lead lies in the fairway for a Loxley Edge channel, and combined STOIIP potential in the lead is in the region of 8 mmbo. Further interpretation using the 2D seismic shot by Europa in 2007 has also not firmed up this lead.

The Gravel Pits lead, **Figures 9 & 10**, was a poorly-defined lead relying on rollover into the main Whisby-Aubourn-Bassingham High eastern bounding fault. The southeastern closure of this lead is poorly defined, though there was potential for up to 6.5 mmbo of STOIIP in the rollover at the Basal Sandstone and Loxley Edge levels assuming closure to the southeast. This lead was fully tested with the Hykeham 1, 1z wells but found only residual oil in the basal sands immediately overlying the Dinantian limestones, and water wet sands higher up in the Namurian/Westphalian sequence.

Haddington lead, is a fault and dip-closed culmination at Top Dinantian level up-dip from wells with oil shows in the Basal Sandstone. The Caledonian Farm-1 well demonstrated a particularly good section of Basal Sandstone with what appears to be an oil transition zone in the upper part of the sand sequence. Consequently, potential still exists up-dip from this location at Haddington. However, the fault required to generate closure is only seen on one seismic line and the risk of lack of fault closure is significant. This lead is located in the relinquished section to the south of the original license block and was classed as weak.



Figure 9. Original block boundary in yellow,

After the drilling and further analysis of the Hykeham-1 well, further interpretation of the seismic has been conducted to evaluate any additional prospectivity. This evaluation included mapping the Top Sherwood (Bunter) Sandstone horizon and the Top Z3 Carbonate (Brotherton Limestone Formation) because each of these horizons are in fact producing reservoirs elsewhere in the UK. The Top Westphalian A and the Top Namurian surfaces were also picked as each of these would act as a proxy for the various Westphalian A and Upper Namurian sand prone intervals such as the Tupton Rock, Mickley Rock, Loxley Edge and Rough Rock sands. Each of these horizons either have shows or they are producing reservoirs nearby. The Top Dinantian Carbonate was picked because the upper surface of the carbonate is often weathered and likely, in some places, to be karstified and hydrocarbon shows are reported at this horizon in offset wells; this horizon also acts as the marker horizon for the Basal Sand which has shows in offset wells and is believed to be a transgressive sand onlapping the top Dinantian Carbonate surface. See **Figure 11**.

An intra Dinantian horizon was also interpreted, this was in general concordance with the Top Dinantian horizon and so there were no compelling indications for deeper prospectivity.

The picked horizons are shown in **Figure 10**. Also shown is the style of faulting which generally appears reversed, the faulting only rarely penetrates shallower than the Variscan unconformity.

Inspection of the Top Dinantian two way time map in **Figure 11**, indicates that all the significant structures showing closure in PEDL 150 have now been drilled. There are a few small closed structures seen on this map, but they are low relief, small in area and only seen on single seismic lines and this is usually where the line spacing is wide. Given these factors and the variability in the data (as described above) these closures cannot now be considered to represent significant leads.



Figure 10. Example seismic line showing the data quality and the horizons that were picked.



Figure 11. Two way time structure map of the Top Dinantian horizon.

6. Further technical work undertaken

The GORE geochemical survey.

The survey covered about 47 sq. km. of EUROPA's original PEDL150 block. The objective of the survey was to identify potential areas of reservoir charge analogous to the Whisby field, including assessment of charge potential in several structural leads identified by EUROPA from prior seismic interpretations. The layout of the sample stations is shown in **Figure 12**.



Figure 12: Original PEDL 150 block outline in yellow. GORE survey outline in purple, and stations represented by small black squares with red infill.

Signal quality for the survey was good and data were assessed as fit for use for geochemical modeling of hydrocarbon prospectivity. None of the leads, as currently interpreted from seismic data and mapped by Europa Oil & Gas, reveal any anomalous tendency. Several small to moderately sized anomalies are defined to the SW of the Blackland Park production license area. The general geometry of these features is consistent with the possible presence of a charged elongate channel-like sand body although the sample spacing in this part of the survey area may not be able to resolve the geometry of the anomaly to describe such a stratigraphic feature. The results however are viewed as adequate for focusing new exploration activity and should be integrated with all geological and geophysical data when it becomes available. The tendency for an anomalous response in the area immediately east of the Whisby field should act as a guide for focusing acquisition of more comprehensive exploration data than is currently available in that area.

7. Resource and Risk Summary

There are no remaining undrilled structures defined by the Top Dinantian, Top Namurian or Top Westphalian A horizons. Therefore it is concluded that there is no remaining 4-way dip or 3-way/fault closed structural prospectivity either at the Top Dinantian level or at the Namurian sand horizon e.g. Rough Rock, or at the Westphalian A sands level e.g. Loxley Edge, Mickley Rock & Tupton Rock. All of these reservoirs have shows or have flowed on test when drilled on valid dip closures in and around PEDL 150.

There are also no remaining structural closures at the Top Z3 Carbonate (Brotherton Formation) nor at the Top Sherwood (Bunter) Sandstone horizon. Therefore it is also concluded that there is no remaining structural prospectivity at either of these horizons which are proven, producing reservoirs elsewhere within the UK Onshore/UKCS.

The 2D line spacing is regarded as too wide and too irregular, and the processing of the seismic data is too variable, to attempt to search for stratigraphic potential or use seismic attributes to investigate reservoir characteristics.

8. Conclusions

The Whisby Field (albeit with modest reserve potential) proves the presence of effective reservoirs and an effective charge mechanism from an oil kitchen, it also proves the presence of effective seal intervals.

The Hykeham-1 well targeted the last remaining significant 4-way dip closed structural trap within PEDL 150, there are no remaining undrilled mapped highs at any of the known and proven reservoir horizons.

Based on the current mapping (using all the available data), no undrilled leads or prospects have been identified on the structure maps. Therefore, the future prospectivity potential of PEDL 150 is regarded as too low to warrant further investment. The results of the seismic interpretation does not support further work on the acreage. Prospects are small and high risk.

9. Clearance

DECC is free to publish this report after the 14th onshore Licence Round, that is from the 28th October 2014.