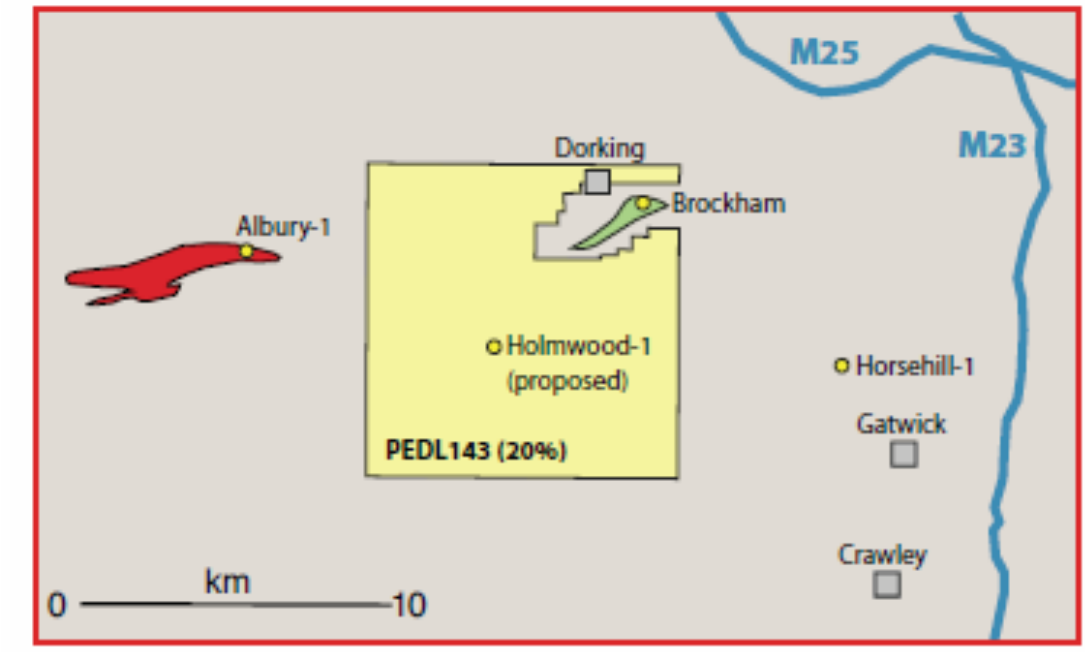
UK Oil & Gas PLC

UK Onshore Licence PEDL143

Holmwood

Final Relinquishment Report



February 2021

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1. Licence Information

Licence Number	PEDL143
Licence Round	12th UK Onshore Licence Round
Licence Award Date	Awarded 1st October 2004
Block Number (s)	TQ14 (part)
Licencees	Awarded to Europa Oil & Gas Limited – acquired by UK Oil & Gas PLC effective 29th March 2019
Licence Relinquished	Date 26th September 2020

Table 1. PEDL143 Licence Information

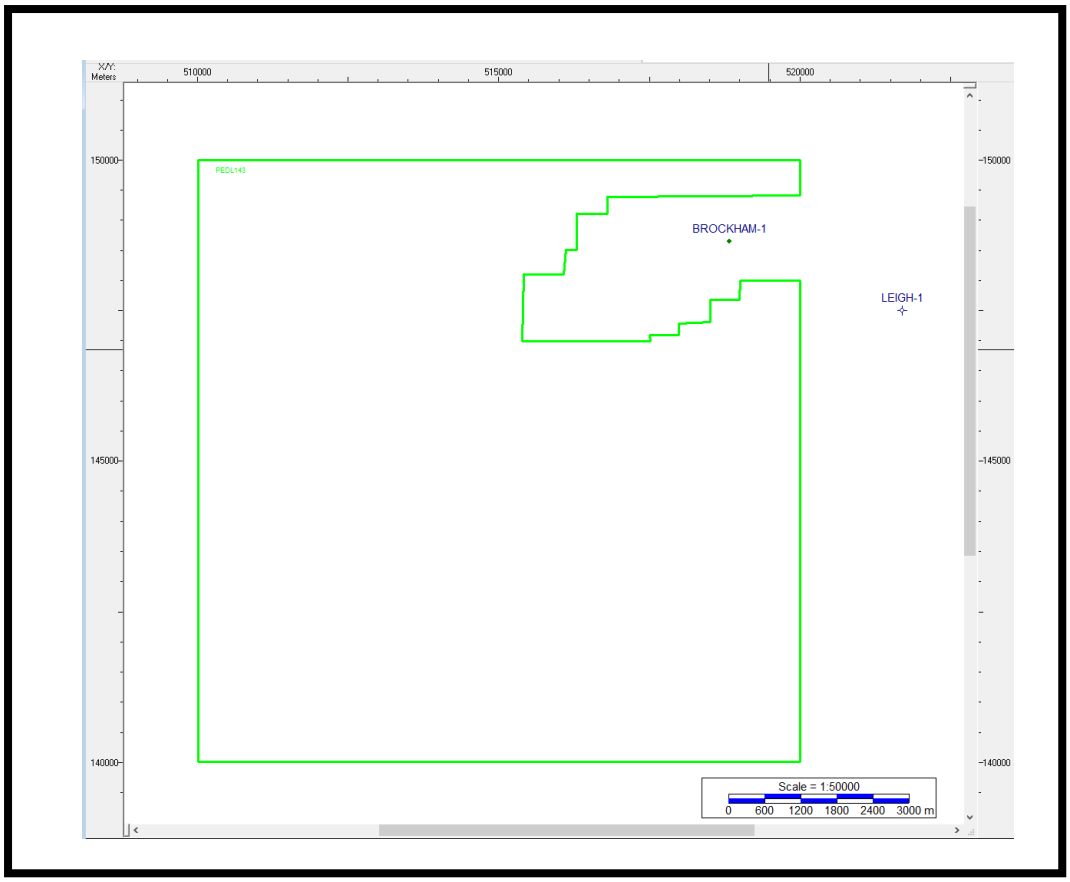

Figure 1. Licence Location Map

The Operator UK Oil & Gas PLC confirms that all permissions to publish have been obtained and that the OGA are free to publish this relinquishment report.

2. Licence Synopsis

2.1 Licence Status

UK Onshore Licence PEDL143 is located on the northern side of the Weald Basin in the county of Surrey approx. 5km south of Dorking. The Holmwood Prospect underlies an Area of Outstanding Natural Beauty, populated with ancient monuments and SSSI's.

It was relinquished near the end of the first licence period after being granted many extensions. The relinquishment decision due to the failure, following a 12-year legal process, to achieve Planning Permission for a well at Holmwood, which meant that the drilling commitment on the licence could not be fulfilled.

2.2 Summary

This licence was awarded effective 1st October 2004 as part of the 12th Onshore Licensing Round. Originally two separate groups applied for the same area – one was Europa Oil & Gas Ltd ("Europa") and the other comprised Egdon Resources (U.K.) Limited, Warwick Energy and Production Limited and Altwood Petroleum Limited.

As both groups showed an identical understanding of the area and both offered a firm well to test the Holmwood or Coldharbour structure the Dept. of Trade & Industry facilitated a joint award to both groups. It was agreed by the parties that Europa should be the Operator.

The Licence itself was dated 3rd May 2005. The initial licence period was 1st Period of 6 years followed by a possible 2nd Period of 5 years and then a 3rd Term of 20 years.

The original Licence Boundaries are set out in Appendix A.

Original licencees May 2005 (effective 1st October 2004):

Europa Oil & Gas Ltd	40.0% (Operator)
Egdon Resources (U.K.) Limited	38.4%
Warwick Energy and Production Limited	20.0%
Altwood Petroleum Limited	1.6%

Due to refusal of the County Council to grant planning permission and the subsequent appeals by the Licencees, the Secretary of State agreed (dated 12th February 2010) to vary the Licence to an initial term of eight years from 1st October 2004 and a second term of three years.

This was again varied with a one-year extension on 16th March 2012 and 5th April 2012 to an initial eight-year term and a three-year second term. On the 1st June 2015, following another Planning Enquiry and various legal challenges, the Secretary of State for Energy & Climate Change varied the Licence to an initial term of twelve years from 1st October 2004 and a second term of four years with the future production period reduced to fifteen years.

Egdon Resources (U.K.) Ltd farmed out an interest to UK Oil & Gas Investments PLC (later UK Oil & Gas PLC, "UKOG") effective 20th November 2015 altering the interests to:

Europa Oil & Gas Ltd	40.0% (Operator)
UK Oil & Gas Investments PLC	20.0%
Warwick Energy and Production Limited	20.0%

Egdon Resources (U.K.) Limited	18.4%
Altwood Petroleum Limited	1.6%

In January 2016 Warwick disposed of some interests to UKOG and Europa farmed out a small interest to Union Jack Oil & Gas plc - altering the interests by end May 2016 to:

Europa Oil & Gas Ltd	32.5% (Operator)
UK Oil & Gas Investments PLC	30.0%
Egdon Resources (U.K.) Limited	18.4%
Warwick Energy and Production Limited	10.0%
Union Jack Oil & Gas plc	7.5%
Altwood Petroleum Limited	1.6%

On 14th June 2016 the Oil & Gas Authority ("OGA") extended the Licence to an initial term of fourteen years (expiring on 1st October 2018), with a second term of two years, with the future production period reduced accordingly.

In February 2017 Europa farmed out a small interest to Angus Energy Weald Basin No.3 Limited - altering the interests to:

Europa Oil & Gas Ltd	20.0 % (Operator)
UK Oil & Gas Investments PLC	30.0%
Egdon Resources (U.K.) Limited	18.4 %
Angus Energy Weald Basin No.3 Limited	12.5%
Warwick Energy and Production Limited	10.0 %
Union Jack Oil & Gas plc	7.5%
Altwood Petroleum Limited	1.6%

On 22nd June 2017 OGA issued a Deed of Rectification due to an error in a Deed of Assignment issued on 23rd March 2017.

In November 2017 UKOG purchased the remaining interests of Warwick altering the interests to:

Europa Oil & Gas Ltd	20.0 % (Operator)
UK Oil & Gas Investments PLC	40.0%
Egdon Resources (U.K.) Limited	18.4 %
Angus Energy Weald Basin No.3 Limited	12.5%
Union Jack Oil & Gas plc	7.5%
Altwood Petroleum Limited	1.6%

Due to further planning delays OGA extended the licence to 30th September 2020 in January 2018 (deed dated 19th June 2018) an initial term of sixteen years, with a second term of two years, and the future production period reduced to thirteen years.

UK Oil & Gas Investments PLC became UK Oil & Gas PLC on 31st July 2018.

On 7th December 2018 Europa resigned as Operator following the refusal of the landowners (the Forestry Commission) to extend the lease for the Holmwood site and their refusal to lease any other site to the Licencees. Europa were replaced by UKOG – this was approved by OGA on 26th March 2019.

On 17th March 2019 UKOG acquired the remaining interests of both Europa & Union Jack altering the interests to:

UK Oil & Gas PLC	67.5%
Egdon Resources (U.K.) Limited	18.4 %
Angus Energy Weald Basin No.3 Limited	12.5%
Altwood Petroleum Limited	1.6%

In order to progress a new drilling location UKOG then applied for a further two-year licence extension to 30th September 2022 on 26th April 2019 and this was approved in August 2019.

It was decided to relinquish the Licence and an application to do so was filed on 28th August 2020 and a final Determination as relinquished was made by the OGA on 26th September 2020 ref. LAA/2020/139/1.

Original Licence Prospectivity

The only prospective target in PEDL143 was considered to be in the area immediately southwest of the Brockham Field, where an undrilled structural prospect was identified by both Europa and Egdon at Portlandian and Corallian levels. The prospect, named Holmwood (or Coldharbour), lies some 5km south of Dorking. It forms two anticlinal culminations at Portland Sandstone level, North and South Holmwood and a large single closure at Corallian level, Holmwood Deep. Because it can be shown to pre-date the Tertiary inversion, it is considered to be one of the best undrilled prospects in the Weald Basin.

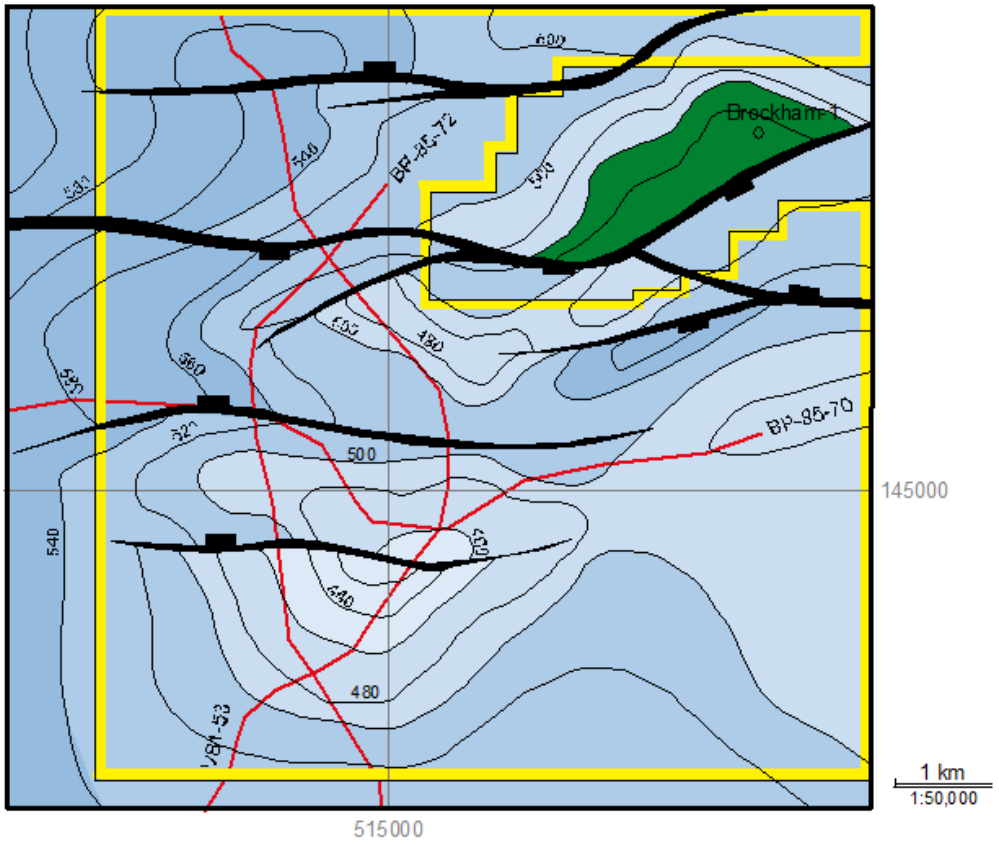

Figure 2. Original Prospectivity Map Top Portland Two-way Time

Europa Licence Application

2.3 Work Programme Summary

The 1st Term had the following Work Commitment:

Firm commitment

The Licensee shall drill one well

Work carried out

No new seismic data was acquired on the Licence.

Geological studies and depth conversion work were carried out, but the main expenditures related to drilling and site construction studies and other work to support the many legal and planning actions.

3. Database

The group had access to all the historic seismic data acquired in the Licence.

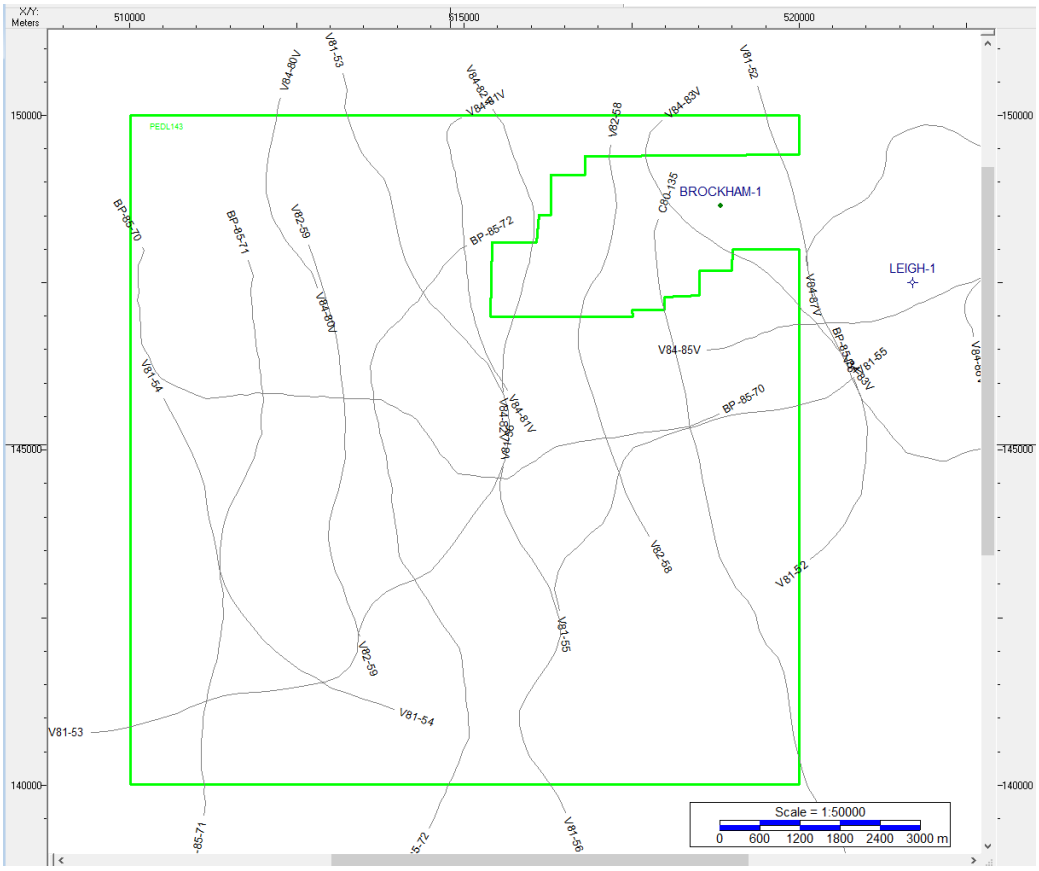

Figure 3. License Seismic Database

All the data is Vibroseis aquired by Voyager and BP in 1980 and 1985. There is some 1962 Esso dynamite data in the area, but this was very poor quality and not used for the interpretation.

The 2D lines used over the licence and the surrounding area for regional ties total approx. 391 km with 116 km on the licence. Data quality is fair to good.

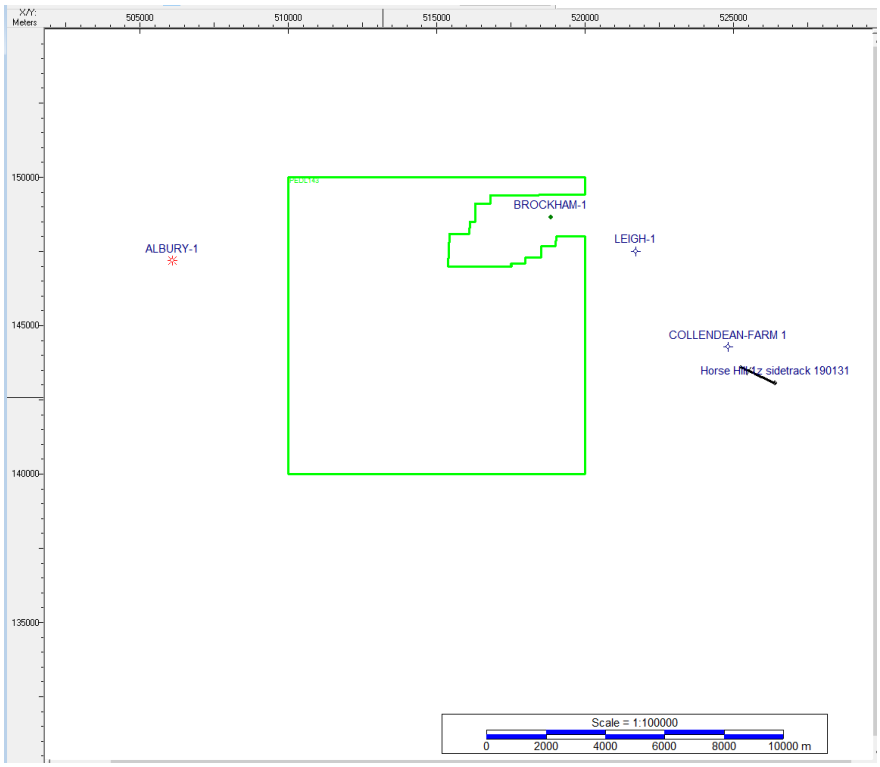

Figure 4. Well Database

UKOG has access to all the released well data in the region.

4. Prospectivity

We have access to the original Licence Application documents and both applicant groups identified the same structure (Holmwood or Coldharbour) with very similar maps. The Prospect was considered "ready to drill" on award. Remarkably few changes in the subsurface evaluation have occurred over the years.

4.1 Geology

The geology of the area is well known and reference can be made to the many BGS and academic publications.

Regional geology is well summarised in "The tectono-stratigraphic development and exploration history of the Weald & Wessex Basins" by P W Hawkes et al *Geological Society, London, Special Publications* 1998, v.133; p39-65 and the later 2014 BGS/DECC "Jurassic Weald Shale Study" both of which contain extensive lists of references. For the immediate area reference is made to S. Trueman, 2003. The Humbly Grove, Herriard, Storrington, Singleton, Stockbridge, Goodworth, Horndean, Palmers Wood, Bletchingley and Albury Fields, Hampshire, Surrey and Sussex, UK Onshore. In Gluyas, J. & Hitchens, H.M. (eds.) *United Kingdom Oil and Gas Fields Commemorative Millennium Volume.* Geological Society, London, Memoir 20, p. 929-941.

The Weald Basin is one of a series of Mesozoic sub-basins which include the Wessex Basin in Dorset, the Channel Basin and the Paris Basin.

Drilling from 1890's-1960's in the Weald Basin demonstrated that a thick Mesozoic section underlies the broad inversion anticline mapped at the surface. In the centre of the basin the base of the Jurassic reaches a depth in excess of 2500m. Published estimates of Late Tertiary uplift suggest that prior to inversion burial depths were greater than 3750m.

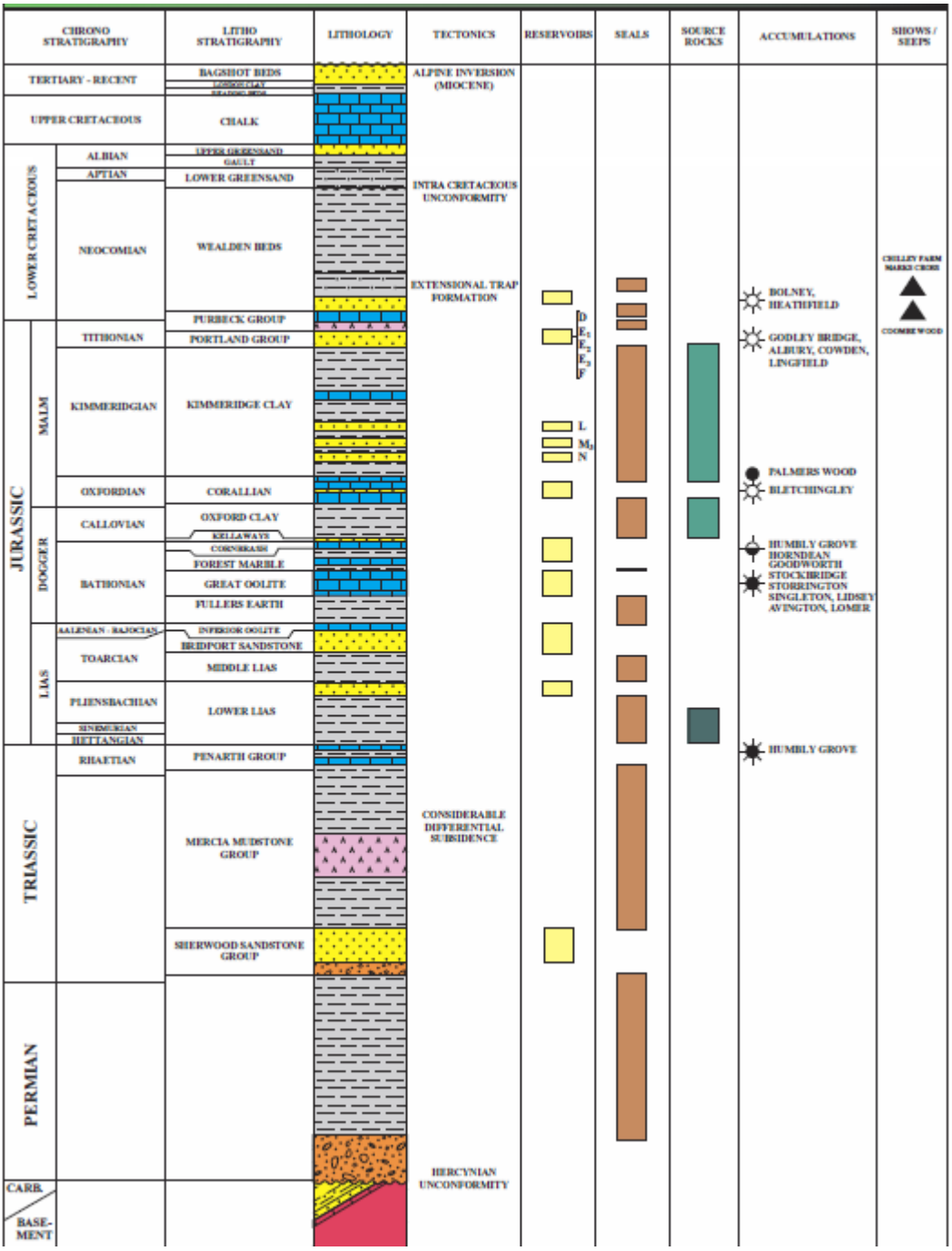

Figure 5. Generalised Stratigraphic Section for the Weald

The D'Arcy Exploration Company began a significant campaign of petroleum exploration in the Weald (and Wessex Basins) with the award of permits in 1935; however, with the exception of some oil and gas shows a commercial discovery was not made in the basin until 1965 at Bletchingley by BP and Esso. The gas discovery was made in a carbonate reservoir in the Corallian sequence. The earlier wells based upon surface geology were largely drilled off-structure.

It was not until 1980 that Carless made the first oil discovery in the Jurassic Great Oolite reservoir at Humbly Grove with the aid of modern seismic data.

The application area lies within the Weald Basin in the county of Surrey. It lies to the north of the basin and the producing fields of Albury, Brockham and Palmers Wood lie close to the block. The area is dominated by W-E trending faults; however, cross-cutting fault trends (particularly WNW-ESE) form important transfer fault segments and have been important in the development of traps. Hanging wall anticlines developed during the Late Tertiary inversion of the Weald Basin.

The Carboniferous reservoirs encountered to date have been tight and are not considered prospective. The majority of the produced reserves of the Weald Basin lie in the Great Oolite Formation. The reservoir has only proved prospective to date on the southern and western margins of the basin (Storrington, Singleton, Lidsey, Horndean, Humbly Grove, Avington and Stockbridge. It is not considered prospective within the area of application. Other producing reservoirs are encountered in the Triassic Penarth Group, Late Jurassic Corallian, Kimmeridgian, Purbeck, Portland, and Early Cretaceous Wealden.

The lateral seals within the Jurassic are very extensive in the Weald Basin and include shales of the Forest Marble Formation (Great Oolite seal), Kimmeridge Clay Formation (Corallian seal) and Purbeck Evaporites (Portland).

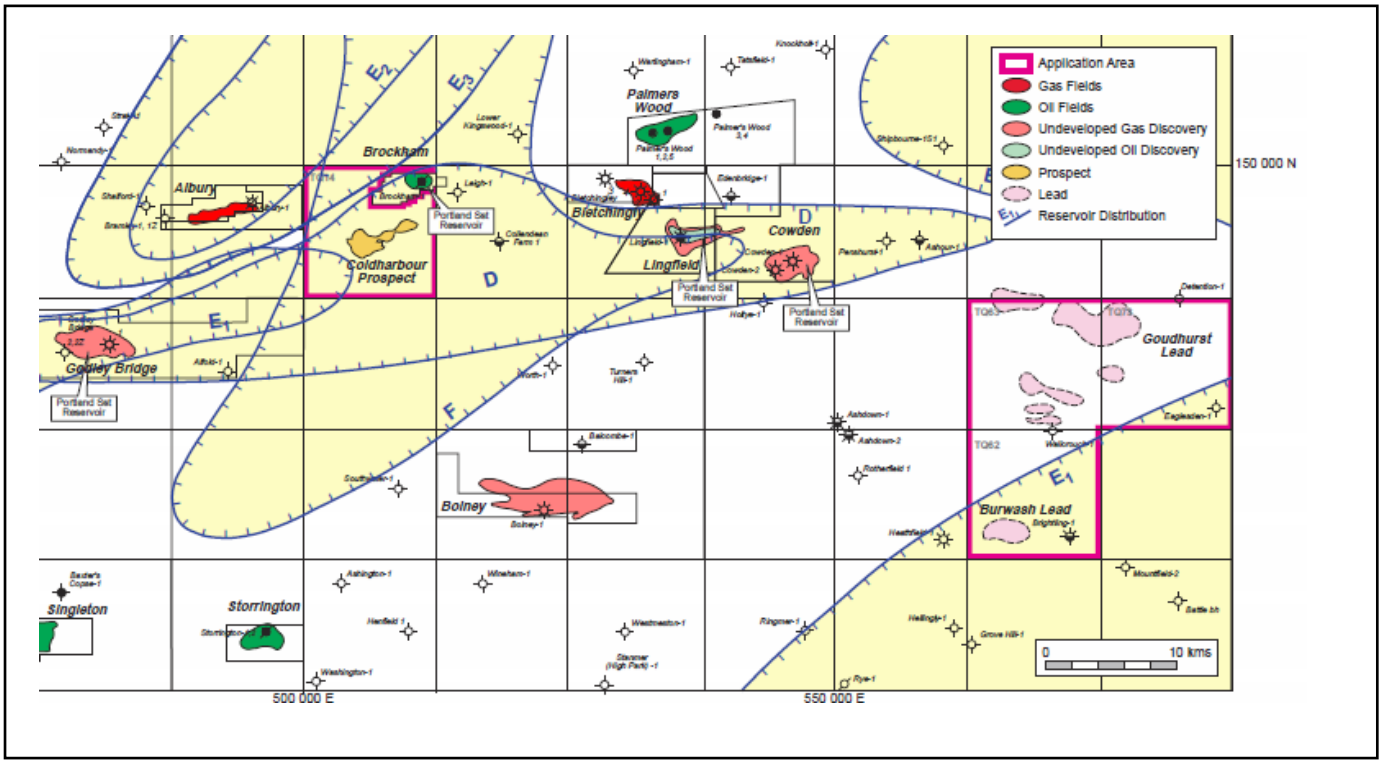

Figure 6. Portland Reservoir Distribution

Sandstones are present within the Corallian throughout the Weald and Wessex Basins of Southern England. The only commercial petroleum accumulation is at Palmers Wood. Gas has been produced from Corallian carbonates at Bletchingley. The reservoir objective within the area of application is the Portland Sandstone. It is believed to be well developed over the identified prospect within the area of application. Hydrocarbons have been discovered within this reservoir at Godley Bridge (15km to east of application area), Brockham (application surrounds block), Lingfield (20km to east), Cowden (30km to east) and at UKOG's Horse Hill.

Within the Weald Basin there are 3 potential source rock intervals of Jurassic age: Lias shales, Oxford Clay (Callovian-Oxfordian) and the Kimmeridge Clay. These all contain organic matter dominated by algal/bacterial input with minor amounts of woody material. The highest source potentials are developed in finely laminated shales with lower potentials in the more homogeneous, bioturbated mudstones. The Carboniferous Coal Measures (for example Kent coal field) may have been a source in the easternmost part of the Weald Basin, but no gas has been found to date.

The published work covering the geochemistry and basin modelling of the Weald Basin indicates that the Lias shales are the principal source of the oil & gas found to date in the basin. This is indicated by oil-source rock correlation work and modelling of maximum burials of the intervals in central portion of the Weald Basin. All the Jurassic oils from the Weald Basin are light crudes, with API gravities in the range of 35 to 42 API.

Reservoir Development

The Portland Sandstone in Brockham-1 is a 127m thickness of lower shoreface sands, deriving from the coastal fringe of the London Platform, to the north. It comprises four regressive, shallowing/cleaning-upward units. Each unit, and the lowest 50m sandstone in particular, includes layers with good log porosity and permeability. However, in the Brockham Field the oil pay is confined to the topmost sandstone. Production tests covering this pay zone showed that the fine-grained sandstone reservoir, though degraded and vertically zoned by varying degrees of calcite cementation, was capable of producing at rates of around 100 bopd. On the basis of core and log analyses, porosities up to 18% and permeabilities exceeding 100 mD are expected in the cleaner, less-cemented sandstone layers.

Mudrocks and calcite-cemented sands form permeability barriers within and between the sandstones in the Portlandian of Brockham-1. This perhaps explains the restriction of the oil to the highest of the sandstone units in a trap structure with up to 50m height of closure.

The Portland Sandstone is expected to extend into PEDL143 to the south of the Brockham Field, and, specifically, into the area of the Holmwood prospect. In the Collendean Farm-1 exploration well, drilled in this hanging-wall setting, about 7km to the SE of the Brockham Field, the four Portland Sandstone units were thinner, finer-grained and generally poorer in reservoir quality. Regional lithofacies studies (Hawkes et al, 1998, Fig. 23) suggest that the deterioration in reservoir quality towards Collendean Farm may reflect a west-to-east, alongshore, element in Portlandian sand transport, as well as the expected shaling-out in the southerly, basinal, direction. Hence the prognosis is that the Holmwood prospect will have a Portland Sandstone reservoir similar to that in the Brockham Field - with the suggestion that, in this deeper, hanging wall setting, these sands may have been charged earlier, thus arresting diagenesis.

The key reservoir risks for the Portland Sandstone arise from the possibility of a southward, distal shale-out of the sandstone units and/or the porosity and permeability loss arising from calcite cementation, an effect that appears to increase with proximity to the overlying Portland Limestone. Again, early charge may have restricted this process.

Corallian Sandstone Reservoir

This deeper reservoir target is also interpreted as a regressive shoreface sandstone, deposited along the coastal fringe of the London Platform (Hawkes et al. 1998, Fig. 20). In the Brockham well, the sandstone is some 20m in gross thickness, with a coarsening/shallowing-upward log motif. Its reservoir properties in Brockham-1 are inferior to those of the Portland Sandstone and, despite some oil shows, it tested 130 bwpd.

Key reservoir risk factors again arise from the possible shaling out of the sandstone south of Brockham, and loss of reservoir quality arising from calcite cementation associated with shell layers (Trueman 2003). Again, early charge may have restricted this process.

The Sherwood Sandstone is considered to be absent or in non-reservoir facies across the licence.

4.2 Seismic

A typical uninterpreted seismic line is shown below.

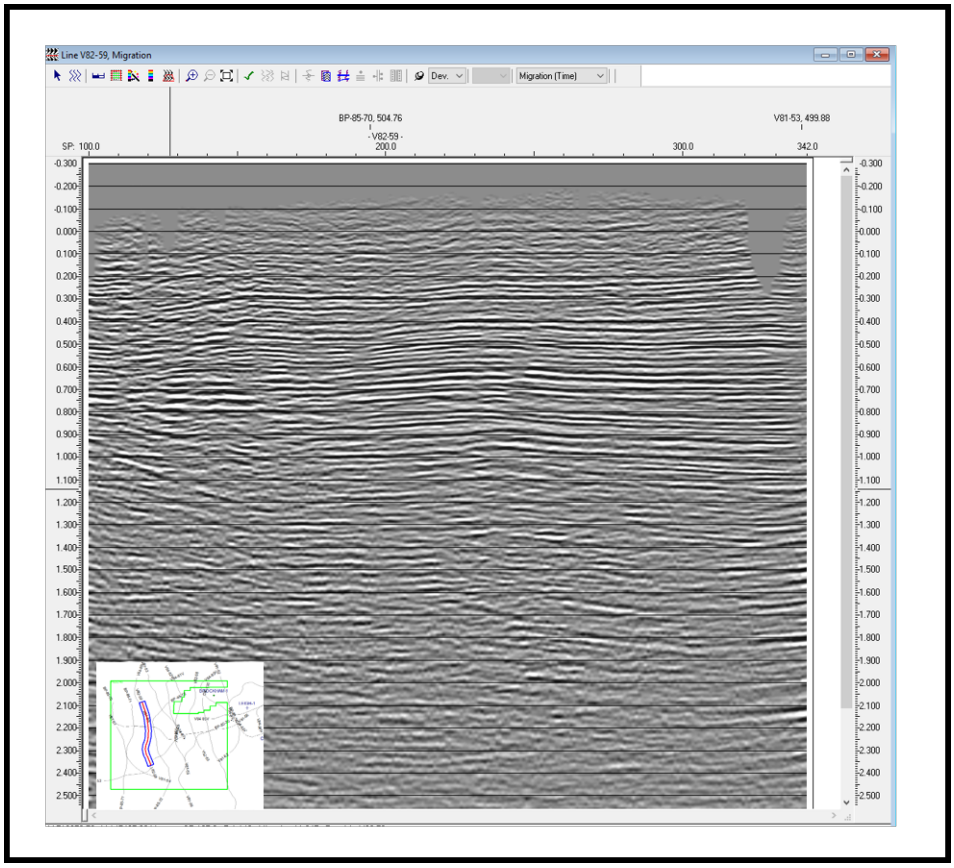

Figure 7. Seismic Line V82-59 (Not Interpreted)

Horizons were tied to the Brockham wells using a VSP and a synthetic seismogram. The horizons were also tied into the Albury, Collendean Farm, Leigh and Horse Hill wells east and west of the block.

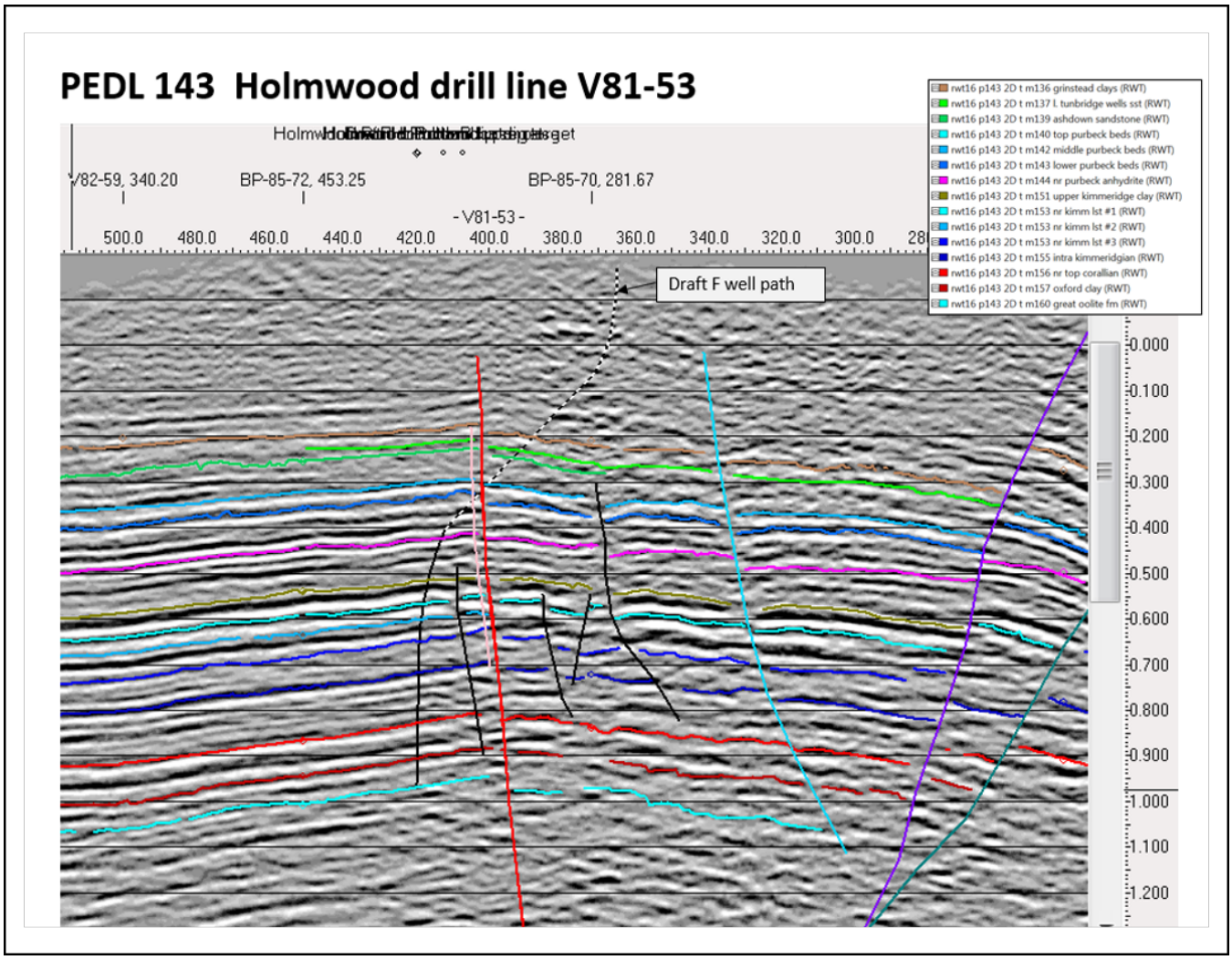

Figure 8. Seismic Line CV81-53 Interpreted Close to Proposed Well Path

Seismic Interpretation

The structural top of the Near Top Purbeck Anhydrite in depth is shown in Figures 9 and 12. Seismic and geological interpretations indicate the field to be a structural trap with a tilted block limited to the north by faulting. The illustrative section (Figure 10) shows the profile of the fault block elements.

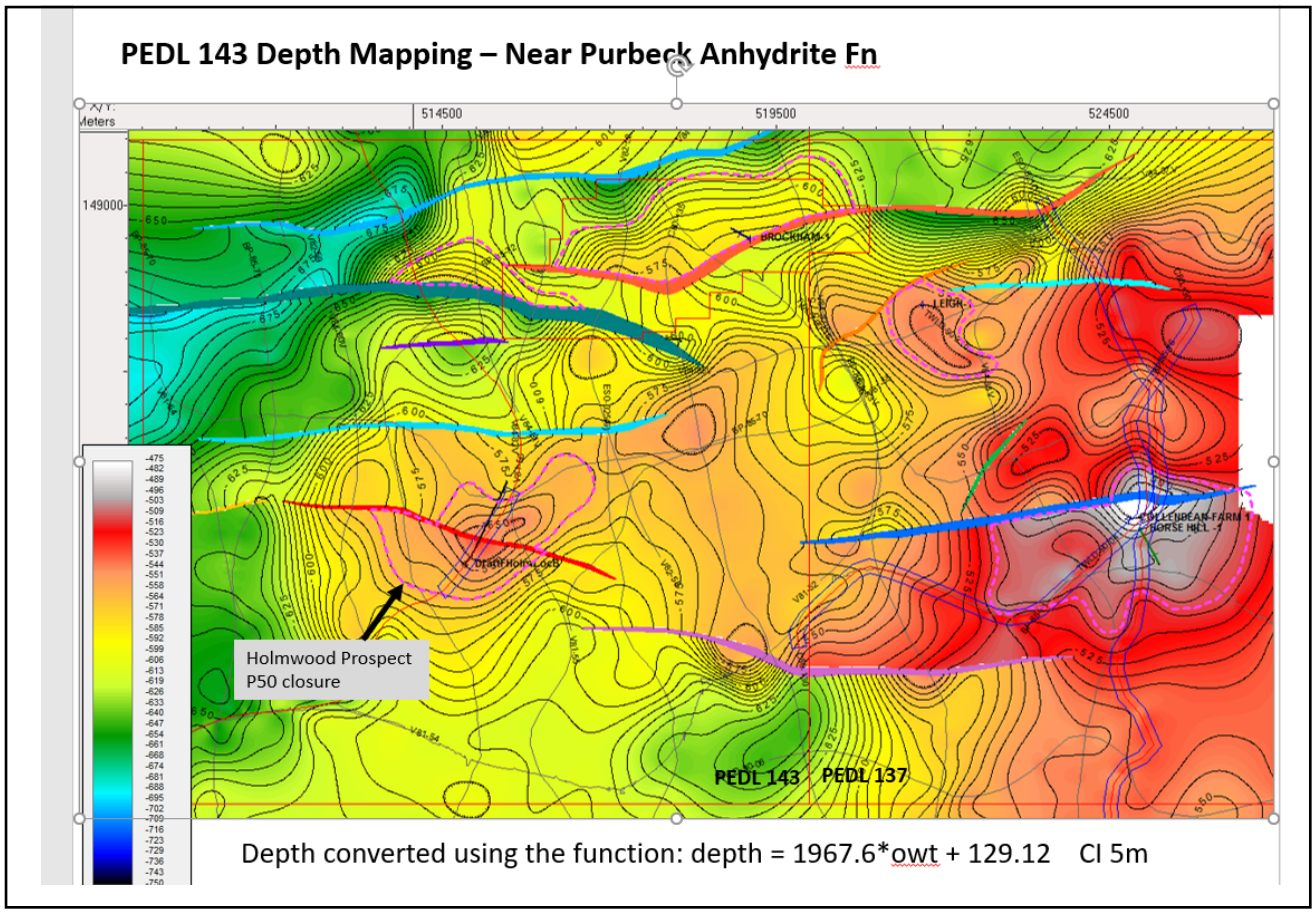

Figure 9. Purbeck Anhydrite Depth Map

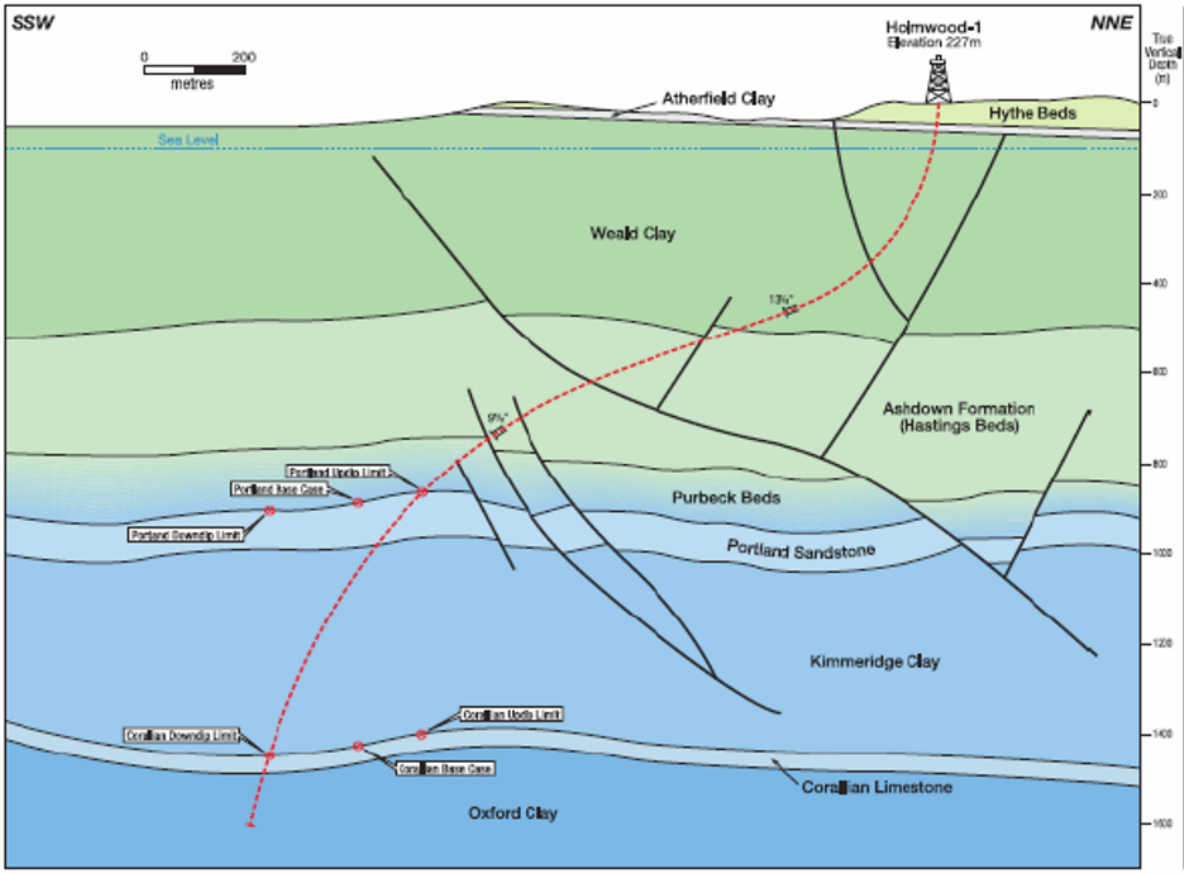

Figure 10. Geo-seismic Cross-section

Depth Conversion

The Top Purbeck Anhydrite depth conversion has a fairly consistent depth conversion function across the Weald based on regional data. However, problems arise in detail between individual wells giving local mis-ties which are not large but can be important for oil/water contacts, closures and reservoir connections.

Historically, seismic depth conversions in this area have also tried to fit various values for closure, free water level (FWL) and quoted "oil/water contacts". However, FWL estimates are subject to uncertainty in calculations of water saturations due to incomplete and uncertain petrophysical data.

The Portland function used here is: Z= -1967.6*TWT + 129.12

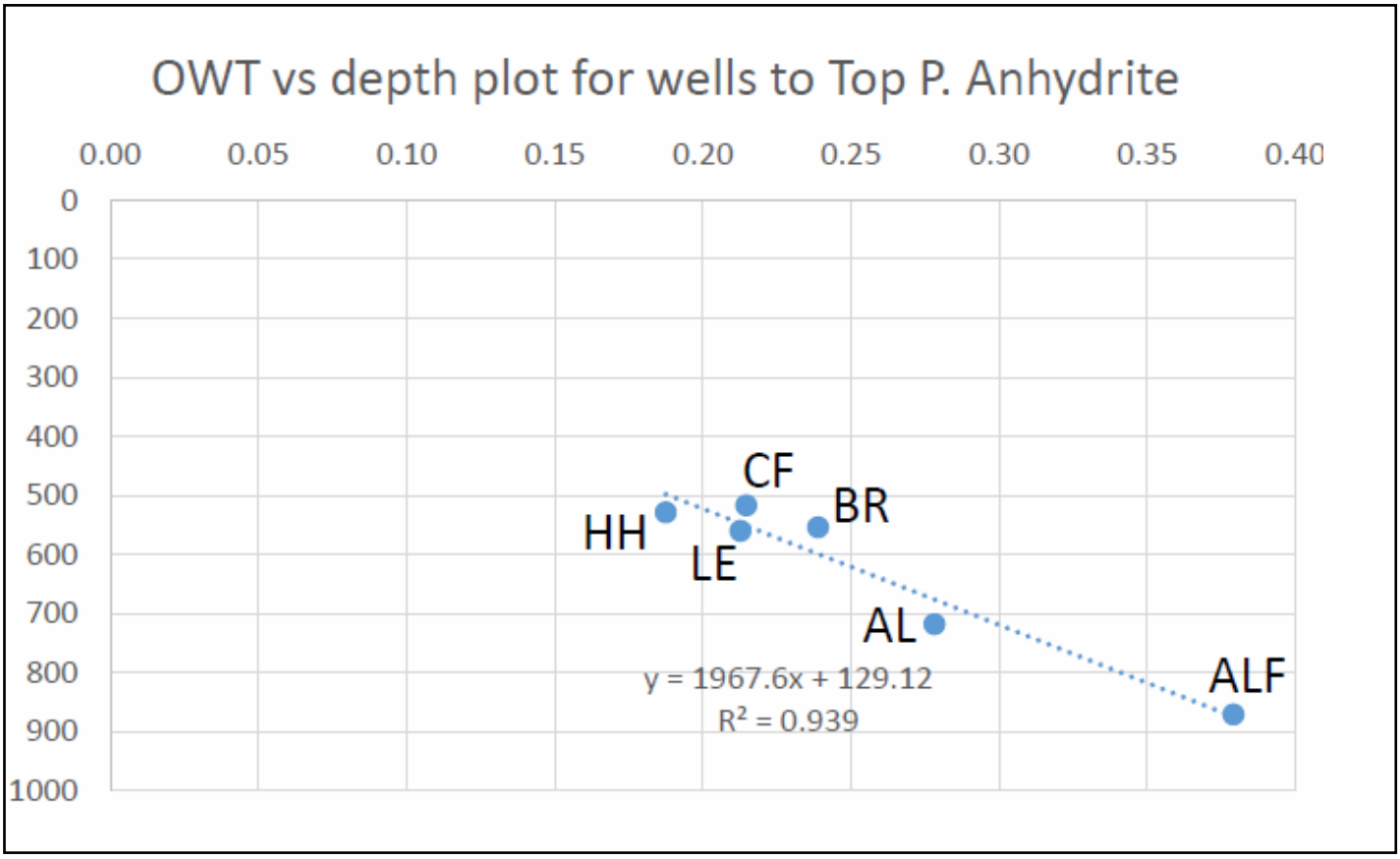

Figure 11. Depth Conversion Function from Local Wells

For depth conversion to the Corallian an interval velocity of 3010 m/s was used.

For Kimmeridgian interval, an average of Brockham and Horse Hill VSP data was used.

Depth conversion to the Great Oolite used an interval velocity of 3440 m/s and for the Oxfordian interval values were taken from Horse Hill.

5. Resources and Recoverable Volumes

The effectiveness of the Jurassic play system in Block TQ14 is illustrated by the Brockham Field, which lies in a footwall setting immediately north of PEDL143. The oil is trapped in a tilted fault-block structure, reservoir at Portland Sandstone level, sourced by the deeper Oxford Clay and sealed by the Purbeck Anhydrite. The Brockham-1 well tested oil at almost 100 bopd from the Portland Sandstone. A deeper, poorer quality, Corallian, regressive sandstone, tested 130 bwpd water, but was judged to have been penetrated further down-dip of the crest of the fault trap.

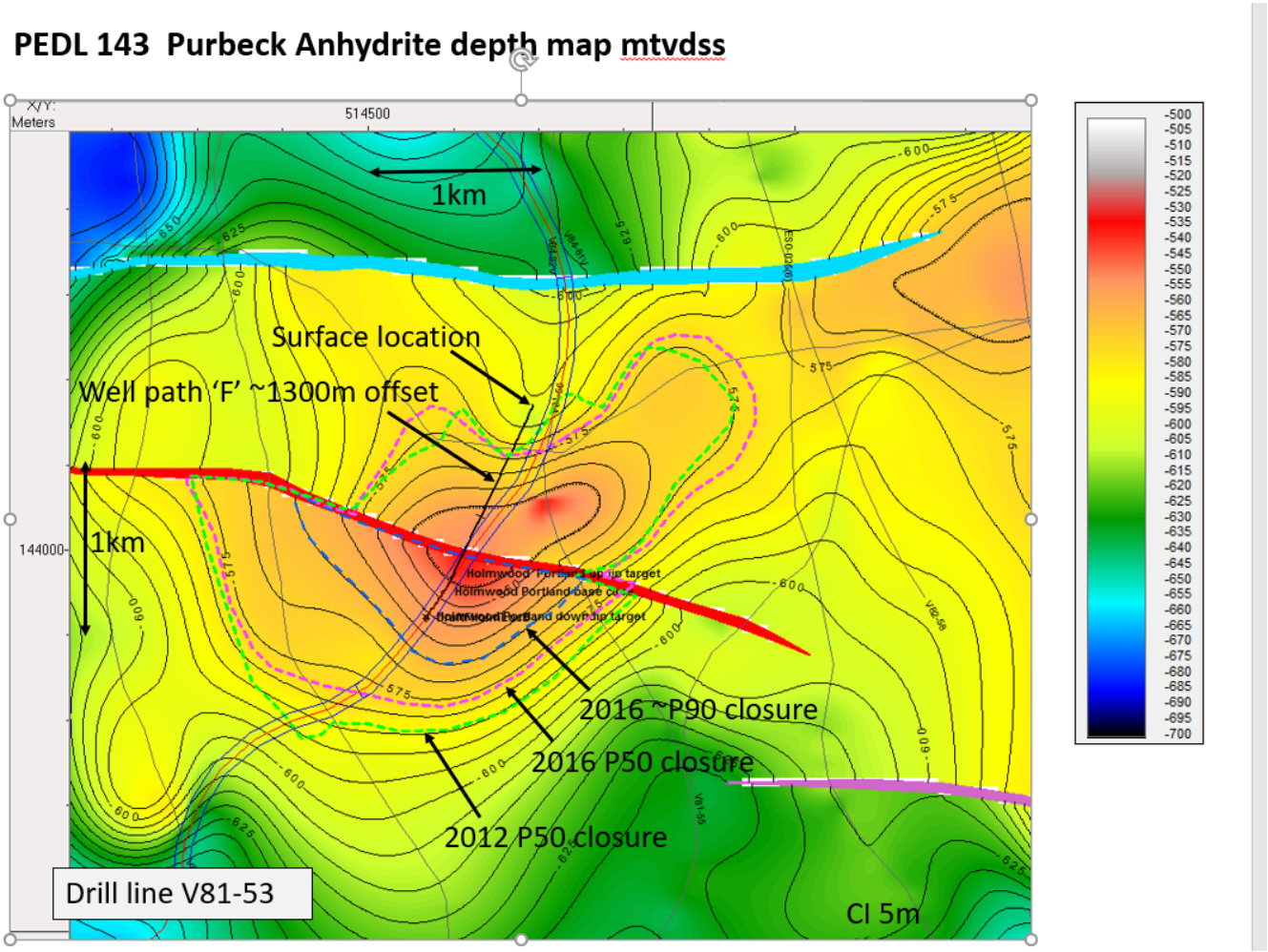

Figure 12. Purbeck Anhydrite Depth Map Over Target

STOIIP values were calculated stochastically.

MMbo	Low	Best	High	Mean
Gross				
Portland	0.26	0.82	2.61	1.24
Corallian	0.55	2.54	9.90	4.40

Table 2. Unrisked Prospective Resources

Risk

The main risk with the prospect is the trapping mechanism, as the structure is defined only on a sparse grid of 2D seismic lines and is low relief. Closure is therefore difficult to define, particularly to the east. An increased risk to trap definition is seen at the deeper Corallian sandstone level. Reservoir presence and effectiveness is a lesser risk; both the Portland sandstone and Corallian sandstone are present in Brockham-1 (although the latter was water bearing).

6. Conclusions

PEDL143 has been fully evaluated from a subsurface perspective. The problem has been very long planning delays to approve drilling.

The commitment well was considered as "ready to drill" on award and the Licensees moved quickly to drill it, starting the planning process in 2005. The proposals met a great deal of opposition from some members of the public and councillors. There were subsequently very lengthy planning delays, protests and a number of legal cases over the next 15 years.

Although the Planning Inspectorate granted planning permission on appeal in 2015, together with a separate planning approval of the well trajectory by Surrey County Council (SCC) in 2015, this permission was subject to several conditions. In particular, planning permission was subject to SCC approving a Transport Management Plan (TMP). This TMP was not approved by SCC.

Further, the well site land was leased from the Forestry Commission. In September 2018 the Forestry Commission refused to renew this land lease and would not lease any other site in the vicinity. This rendered the planned Holmwood-1 exploration well impossible to drill.

Europa then transferred operatorship to UKOG who then designed a well that would test the very edge of the Holmwood structure from a point outside the AONB. It was necessary to start from scratch looking for a new drilling site and related regulatory permissions with no guarantee of success. The well was also going to be very expensive due to the long lateral step-out involved and would not fully test the structure – further, even in the case of success, it was considered highly unlikely that UKOG would be able to get planning permission for future production.
The Licensees therefore decided to relinquish the Licence.

7. Clearance

The Operator UK Oil & Gas PLC confirms that all permissions to publish have been obtained and that the OGA are free to publish this relinquishment report.

APPENDIX A

Description of Original Licensed Area

The area bounded by straight lines joining the following coordinates:

TQ	1000	5000
TQ	2000	5000
TQ	2000	4940

TQ	1680	4940
TQ	1680	4910
TQ	1630	4910
TQ	1630	4850
TQ	1610	4850
TQ	1610	4810
TQ	1540	4810
TQ	1540	4700
TQ	1750	4700
TQ	1750	4710
TQ	1800	4710
TQ	1800	4730
TQ	1850	4730
TQ	1850	4770
TQ	1900	4770
TQ	1900	4800
TQ	2000	4800
TQ	2000	4000
TQ	1000	4000