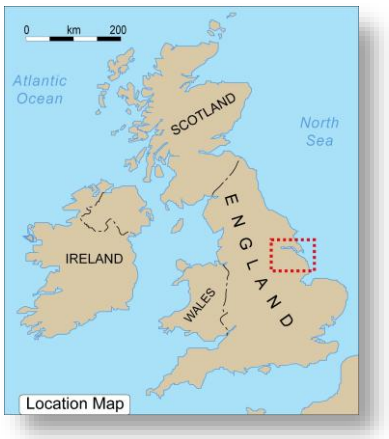
Project Introduction

Onshore United Kingdom

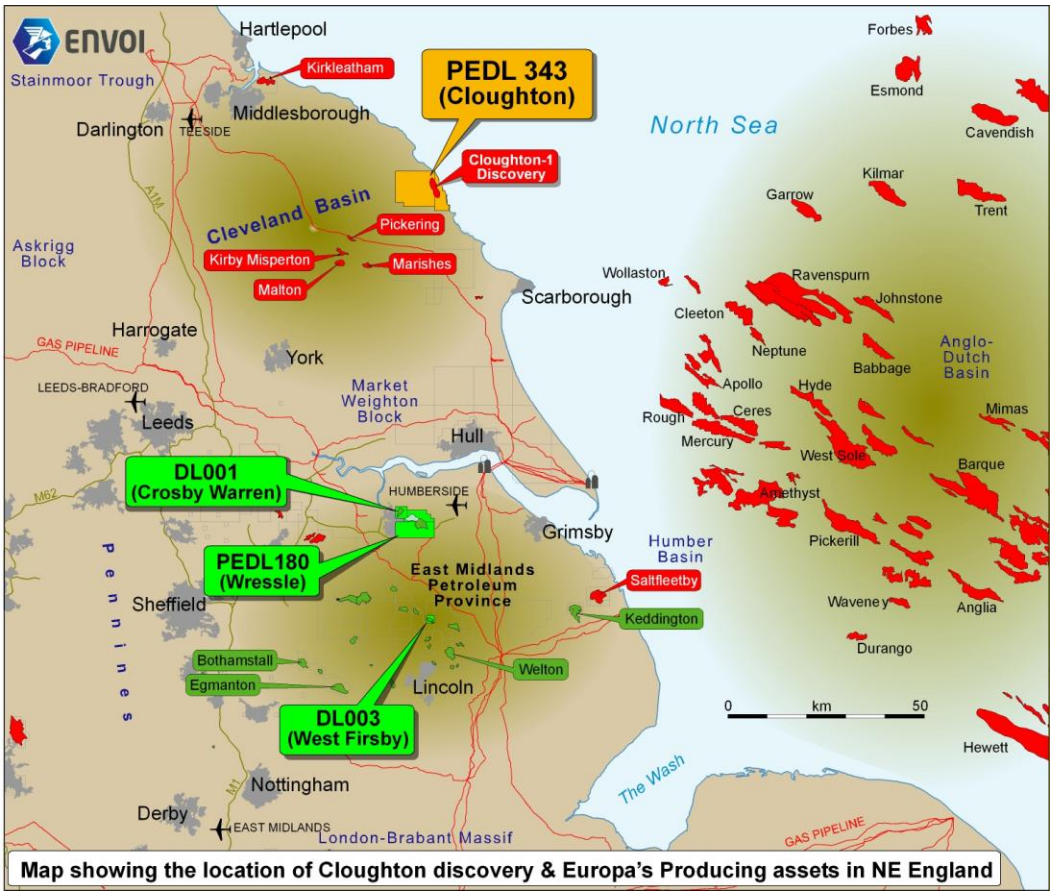


PEDL 343 – Cloughton Gas Field (Cleveland Basin)

- **Opportunity to participate in Appraisal & Development of 1986 Cloughton gas discovery after modern evaluation confirms commerciality of Carboniferous sands analogous to SNS fields**
- **Est. Pmean 137 Bscf GIIP (P50, 61 Bcf recoverable) capable of progressive development to establish 10 MMscf/day production from stimulation of stacked Namurian sands. Requires new 3D to cover entire closure.**
- **Planned work program to include new 3D seismic to cover entire Cloughton closure and accurately locate and drill appraisal well obligation**
- **Up to 40% Equity available by funding the 3D and first well (est. £ 6.56 million net to 80%)**
- **Scoping economics indicate potential NPV10 of £63 million for full Cloughton development**

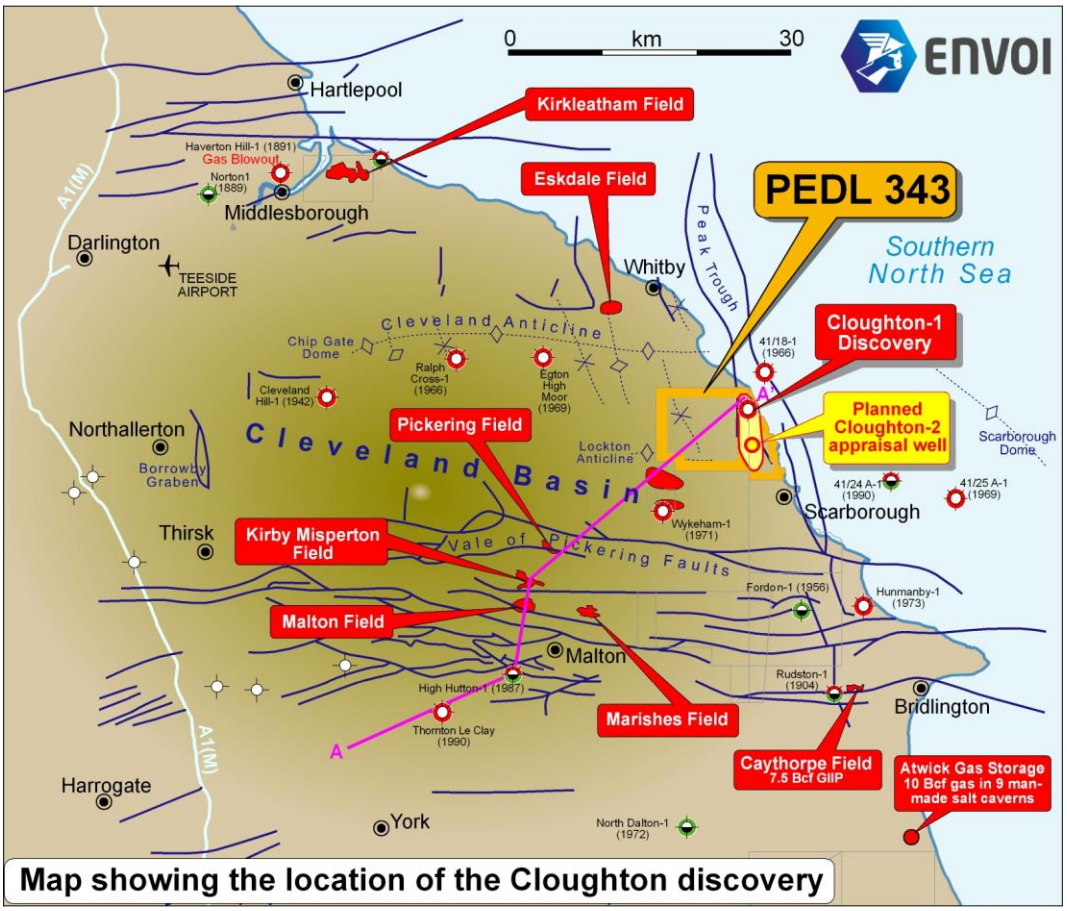
Executive Summary: Envoi has been engaged by both UK-based AIM-listed Europa Oil & Gas Plc ("Europa"), as operator and partner Egdon Resources U.K. Ltd. to assist in the farmout of up to half of their combined 80% interests in the PEDL 343 Cloughton licence situated in the Cleveland Basin. This can be earned in return for funding of the new 3D seismic being planned and subsequent well to appraise the Cloughton gas discovery. This new 3D seismic is required to help refine the structure of the Cloughton accumulation and is a requirement for the stimulation plan to allow commercial volumes of gas to be realised. Current resource estimations based on the existing 2D data are 137 Bscf (Pmean) GIIP and (P50) 61 bcf gross recoverable . This would generate significant cash flow as even fields as small as ~3 bcf recoverable are still commercial onshore UK even with the UK's current fiscal regime.

The original Cloughton-1 discovery well drilled in 1986 by Bow Valley defined gas in the lower poro-perm Carboniferous (Namurian-aged) sandstone reservoirs similar to the fields offshore in the northern part of the southern north sea, but at a time of much lower commodity prices it was deemed uncommercial. The modern and much improved reservoir stimulation techniques, and much higher and sustained gas prices have facilitated the field's recent appraisal and commercial upgrade. The field's Carboniferous sand reservoirs produce long production tails in equivalent Carboniferous fields in the North Sea and Germany and compare favourably to other Cleveland basin fields which mainly produce from the overlying fractured Permian carbonates which tend to water out more quickly.



Map showing the location of Cloughton discovery & Europa's Producing assets in NE England

Carboniferous production has been seen from offset fields with low flow rates rather than early water encroachment being the mechanism for shutting in the production wells. The potential use of hydrogen and CCS as part of the energy transition has also contributed to the Cloughton field's newly defined potential.



Map showing the location of the Cloughton discovery

Exploration History:

The Cleveland Basin remains relatively under-explored compared to other productive basins in the NE of England and East Midlands.

The first exploration in the basin targeted the Triassic and Permian reservoirs below the surface expression of the Cleveland Anticline. D'Arcy Exploration, a forerunner of BP, drilled the successful well Eskdale-2 in 1937, marking the first gas discovery that produced some 0.8 Bcf from the Brotherton Formation in the Zechstein carbonates that are present onshore and form the western margin of the huge European Permian basin. Approximately 100 wells have been drilled in the basin since then, of which only 25 wells can be considered as true exploration tests. Of these 13 have found hydrocarbon accumulations which flowed gas on test and resulted in eight fields being developed to date.

These include the Malton gas field situated in the Vale of Pickering, between York and Scarborough, discovered in 1970 by Home Oil. This was followed by Kirby Misperton in 1985 by Taylor Woodrow and Marishes, drilled by Kelt (at the time the UK subsidiary of Perenco), in 1988. All three of these fields were put into production in 1995. A fourth Vale of Pickering discovery, called Pickering, was discovered in 1992 by Kelt and started production in 2001. Combined, these fields are known as the Ryedale Fields and responsible for around 45 Bcf recoverable gas reserves, which fed the Knapton Generating Station a few kilometres to the east.

The next discovery in 2005 was made in the northern part of the Cleveland basin, closer to Middlesborough, where the Kirkleatham-4 well penetrated gas bearing reservoir in Permian-age Cadeby Formation limestones at only 800 metres depth. This flowed over 5 MMscf/day gas on test, leading to its development with first production in 2010, sold for local power generation.

Some of the discoveries made in the Zechstein have experienced early water breakthrough due to fracturing in the carbonates and resulted in lower than expected recoveries. A good example is the Ralph Cross discovery made in 1966 towards the centre of the Cleveland Basin. Although the discovery flowed 3 MMcf/day, early water break through was caused by the proximal highly mobile, but finite aquifer, which preferentially flows through the high permeability fracture system, bypassing the gas stored in the tighter matrix. In one case, only 12% recovery was achieved from a field estimated to contain 39 Bcf recoverable resources.

This only affects the Permian reservoirs and not the deeper Carboniferous reservoirs as seen in Cloughton, and the Kirby Misperton and Malton field analogues onshore and fields offshore in the northern part of the SNS.

Cloughton Discovery: Bow Valley drilled the Cloughton-1 discovery well in 1986 to a depth of 3,078.5 metres. The well tested a large 4-way dip closed anticlinal structure, defined on the 2D seismic data, prognosed with a 1,200 metre thick sequence of stacked, Carboniferous (Namurian-Dinantian age) sandstones, sourced by the rich interbedded gas-mature, organic-rich Namurian-Dinantian coals and shales.

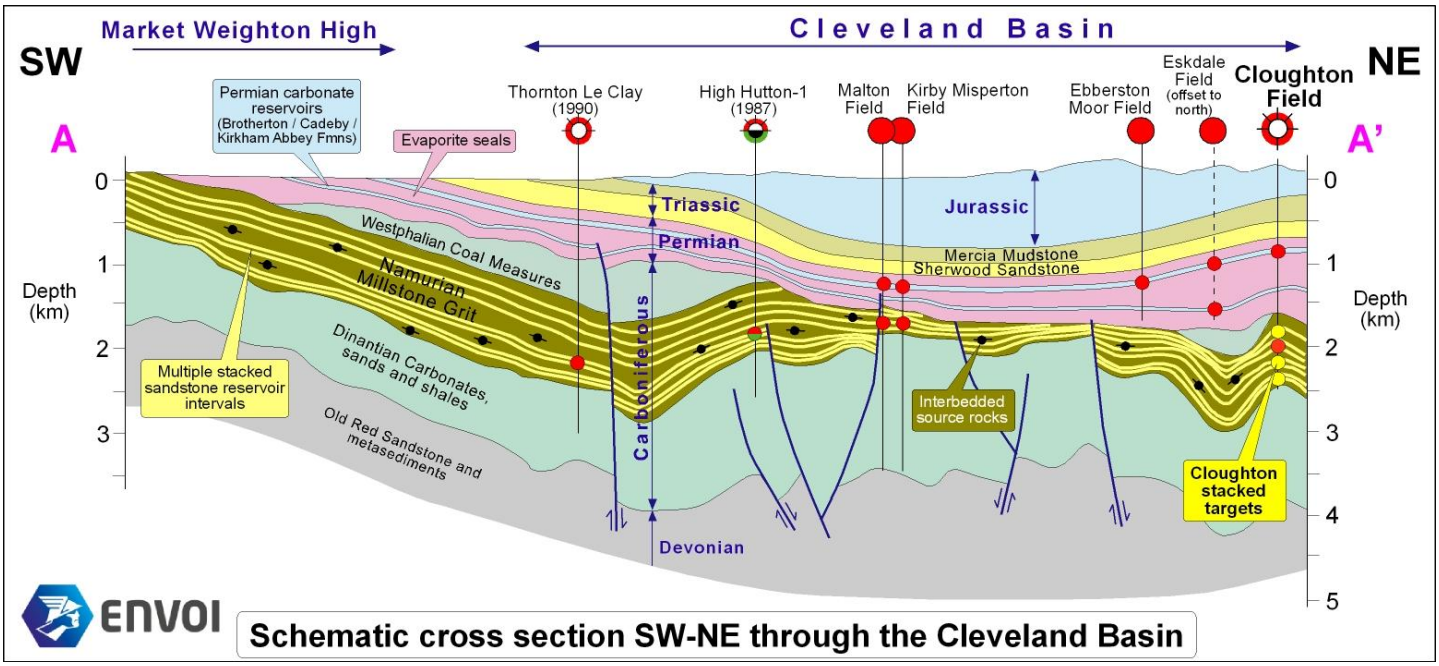
The discovery well flowed at unstimulated rates of between 2,000-20,000 scf/day from three Carboniferous DST test intervals but was never developed due to the low poroperm reservoir and low gas prices at that time. ROC oil held the acreage between 1999 and 2009, with plans for a re-entry and stimulation work programme, but that did not happen before ROC's corporate strategy changed and it exited the licence.

Today, the PEDL 343 Licence covers an area of 110 km^2 over parts of two adjacent UK National Grid blocks, TA09 and SE99a. The Licence was applied for in the 14th Round by groups led by Europa and Third Energy, which in 2014 combined to form one group operated by Third Energy. Following Third Energy's financial failure, Egdon initially assumed operatorship, which was latterly passed on to Europa in June 2023, supported by Egdon. The current Cloughton Licence now comprises Europa 40%, Egdon 40% and Petrichor 20%, whose owner also now controls Egdon.

Until now, Europa has concentrated its resources on enhancing its existing producing assets, but has advanced the Cloughton project ready for the expected new interest in gas, hydrogen and CCS. The Licence was granted a two year extension in February 2024 in which to complete an extension of the existing 3D to cover the whole field and drill one appraisal well. A second Licence term would be granted to continue the appraisal drilling after which a 20 year production Licence can be applied for.

Regional Tectonic & Stratigraphic Evolution: Although evidence of the Early Palaeozoic SW-NE fault pattern from the 'Caledonian Orogeny' can still be seen across British topography, including in the Cleveland Basin, a more significant tectonic imprint was created by plate movement in the late Devonian to early Carboniferous times as continents and Laurussia (a northern continent, including North America and Europe) and Gondwana (a southern continent, including Africa) collided to form the supercontinent Pangaea, with northward compression creating a phase of intense mountain-building across what is now the UK during the late Carboniferous and early Permian. The northern extent of this was responsible for the E-W trending Variscan Front across southern England.

To the north of this, extensional movements on pre-existing and new fault lines resulted in the formation of tilted blocks or half-grabens across what is now central and northern England. Two of these blocks, the Askrigg Block and the Market Weighton Block bound the Cleveland Basin to the west and south. Formation of these grabens coincided with a rise in sea level in



the early Carboniferous (Dinantian) times, marine sedimentation, including widespread limestone deposition, and was followed by thick marine shales in the early Namurian. Subsequent and progressive regression initially produced the Millstone Grit stratigraphy of coarse grits, sandstones, shales and occasional coals.

These were then overlain with large scale deltas providing the widespread coal and sandstone deposition of the Westphalian Coal Measures. These Upper Carboniferous deposits are today mostly absent in the Cleveland Basin today due to the Late Carboniferous Variscan-related inversion and erosion, as increasing plate pressure from the south (in late Westphalian / Stephanian times) uplifted the Pennine hills which now separate the East and West lowlands of England. This Variscan-related inversion is also responsible for the main 'trap-forming event', as it caused several grabens and half grabens to invert. The resulting anticlines have provided most of the oil and gas discoveries to date in northern England.

The structure and facies distribution of the Carboniferous in the Cleveland Basin is, however, still relatively uncertain, due to the lack of deep well penetrations, despite it being proven as containing commercial gas plays.

At the onset of the Permian times, an arid desert/playa lake/inland sea environment prevailed which added to the peneplanation of the uplifted parts of the Upper Carboniferous including the present day Cleveland Basin area. During this time very thin sandstones of the Rotliegend formation were locally preserved but are generally not of reservoir quality. However, the world class seal of the Zechstein formation was deposited with thick evaporite sediments deposited.

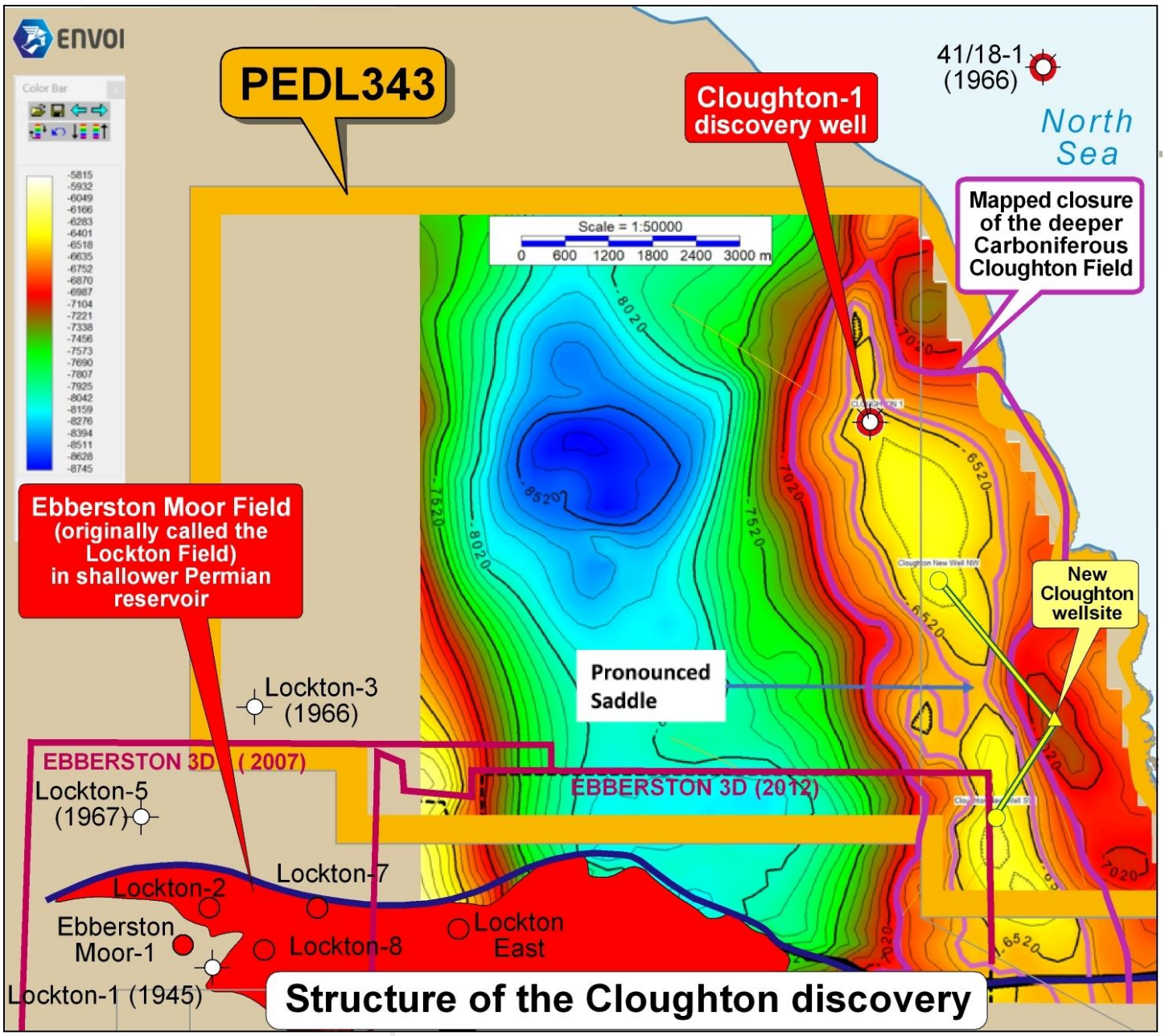
Subsequent Mesozoic strata were then deposited conformably over the NW-SE trending Carboniferous subsurface to the east of the Pennine Hills, and edge of the present North Sea. These strata dip regionally towards the east, due to the uplift of the British Isles during progressive widening of the North Atlantic during Cretaceous and Tertiary times. This has produced little structural deformation other than where this has rejuvenated some of the major old faults.

Petroleum Geology: The Cleveland Basin's currently productive plays consist mostly of Carboniferous and Permian reservoirs, sourced by underlying gas-prone Namurian marine shales and deltaic coals and older Lower Carboniferous marine strata. These are complemented by older Early Carboniferous marine shales, found interbedded with shelf carbonates, which are likely to have made some source contribution.

The primary reservoirs found in the Vale of Pickering fields discovered to date, include the tight Permian-aged Zechstein carbonate reservoirs albeit overprinted by a high permeability fracture system, and older Lower Carbiniferous Namurian Sandstones. Significantly, the Namurian-aged Sabden Shale, Yoredale and Skipton Moor Grit formations of the Millsone Grit stratigraphy form the primary target reservoirs at Cloughton. These range from sandstone units up to tens of metres thick, which at Cloughton are mostly medium to coarse fluvial sandstones, with almost 100% net to gross. Porosities range from 5% to 10%, with permeabilities up to 10 mD. Multiple channel sands were more thickly developed in the hanging walls of extensional faults. When inverted by Variscan compression, these thicker reservoirs then lie on the crestal areas of the anticlinal rollovers with thick seals provided by intra-Carboniferous siltstones and mudstones.

Prospectivity: The Group's work now suggests that the Cloughton closure is larger than originally thought based on the most recent 2D interpretations as the existing 3D, which was focused on other acreage to the south, only covers a small part of the structure (Ref: Figure 5 above). A new Cloughton focused 3D is therefore now planned for Q4, 2025 / early 2026. This is designed to confirm and refine the 2D interpretation and allow better definition of the stacked Namurian reservoir sands to ensure the best location for appraisal drilling and stimulation. The 3D survey is also a requirement for the stimulation plan to provide commercial flow rates

A new well pad over the southern part of the closure will also allow appraisal of the bigger Cloughton resource potential. This has been estimated with a Pmean 137 Bscf GIIP and a gross P50 resource of around 61 Bcf recoverable.



The first appraisal well is expected be to be drilled to a depth of around 2,988 metres MD, ensuring the penetration of a 500 metre sequence of the stacked gas sand reservoirs based on the existing 2D mapping. Given the expected large numbers of gas bearing sands within the Cloughton-1 well (over 1,000m vertical with eleven stacked sands identified) only the four better quality and thicker sands will be selected for reservoir stimulation in the appraisal well. Staged stimulations are predicted to be able to generate initial flow rates up to 10 MMscf/day from these stacked Namurian/Dinantian sands..

Based on Europa's experience and data from similar Carboniferous reservoirs in Germany, the Cloughton resource potential is likely to be an underestimate, as the lower porosity fields in Germany are observed to have a 'reserves tail' which produces gas for much longer than reserves calculations based purely on a net sand porosity cut off - once the better quality sands are drawn down sufficiently then matrix flow from the poorer quality material into the better quality material is achieved.

As a result, the estimated return from the development of Cloughton could be significantly be higher that the post-tax NPV10 of US$ 63 million currently estimated over the field's life.

Work Programme: Europa is awaiting the approvals to acquire a 20 km^2 new 3D seismic survey, at an estimated cost of around £800,000, with acquisition expected to start towards the end of 2025 or early in 2026 with time to assess and define a

suitable well location This will allow a 'drill or drop' decision before Licence expiry by 20th March 2026, which it expects to exercise with a view to an initial appraisal well in Q4 2026 / early 2027 designed to confirm the Namurian potential over the southern part of the Cloughton structure. A planning decision for a well is expected by November 2025 which is currently estimated likely to cost around £6.4 million dry hole gross.

The Opportunity: Europa and Egdon are jointly offering up to a 40% interest in their project in return for funding the new 3D seismic being planned for late 2025 or early 2026 and the first new appraisal well in 2026, which combined are estimated to cost £ 6.56 million sterling net to Europa and Egdon's combined 80% interest.

Further Information: Access to the key data on this opportunity can be made available online after execution of a Confidentiality Agreement (CA).

Serious parties will be invited for a presentation followed by access to the full data set, including the workstation seismic. This can be most effectively achieved by a visit to the physical data room at Europa's office in London.

All expressions of interest and requests for more information, including a copy of the CA, should be made through Envoi.

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