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DEVELOP



# Jurassic Tight Oil Conceptual Development Study

## Executive Summary

UK Oil & Gas Investments PLC

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## EXECUTIVE SUMMARY

UK Oil & Gas Investments PLC (“UKOG”) has working interests in 9 petroleum licences in the Weald and Purbeck Wight Basins, with a further two licences pending approval. These include the Horse Hill licences (PEDL137 and PEDL246).

Specialist companies Nutech and Schlumberger have estimated significant volumes of oil in place in the Jurassic tight oil (“tight oil”) section within these two licences, following drilling of the Horse Hill-1 (“HH-1”) well in 2014. Further studies by Nutech are ongoing to assess the tight oil potential of all UKOG’s licences within the overall Weald-Purbeck Wight regional basin petroleum system.

Whilst UKOG is focusing its immediate attention on the potential development of the shallower conventional HH-1 oil discovery in the Upper Portland sandstones, the company would also like to gain an initial understanding of the scope of a possible future development of the deeper Weald Basin limestone tight oil reservoirs: the potential equipment required, the environmental emissions, the land required, the visual and noise impacts and the operational issues, together with the associated costs.

It should be noted that the input assumptions for field and well performance used as the basis for the study are at a scoping level and are based upon geological and reservoir engineering assumptions, modelling, use of producing analogues and calculations based on findings from the HH-1 and other basin wells. A further calibration of these initial assumptions will likely be made following the flow testing of the HH-1 well.

This development study is only conceptual at this stage and should not be misconstrued so as to convey that recoverable resources, contingent resources or reserves have been proven to exist within the tight Jurassic limestone oil play at Horse Hill or over other UKOG assets in the Weald basin.

UKOG envisages a possible tight oil development to comprise a number of long horizontal oil production wells from multi-well pads, linked to nearby production processing facilities to treat and export the produced fluids. Produced water would be cleaned and re-injected into the reservoir and the gas used as fuel to power the field.

UKOG further envisages that a tight oil well pad could potentially produce at a peak rate of around 2,500 barrels of oil per day (“bopd”), depending on the number and pace of wells drilled and the phasing of them being brought into production.

UKOG requested Xodus Group Ltd (“Xodus”) to analyse the possible surface facilities required for the tight oil development, initially focusing on the production from a single multi-well pad and a single production processing facility. Utilising its extensive in-house experience, UKOG’s notional production profiles and fluid composition data from analogue fields, Xodus developed conceptual multi-well pad and production processing facility designs that satisfied UKOG’s criteria. Xodus also estimated the related capital expenditure.

The conclusions from this preliminary study are as follows.

A single tight oil multi-well pad conceptual design has been completed, with 16 well slots in two rows of 8, nominally: 12 production wells, 1 water reinjection well and 3 spare/future slots. The wells will be in a “cellar” arrangement, around 5m below ground, allowing efficient drilling and minimal visual impact, see Figure 1. The well pad production manifolds can also be installed either above or below ground.

Artificial lift is required for the tight oil field. The preferred option aimed at further reducing surface footprint, noise and visual impact is for the artificial lift to be performed by Progressive Cavity Electrical Submersible Pumps, which would be situated downhole in the wells themselves. Standard electrically powered beam pumps (“nodding donkeys”) could also be utilised, as is common practice in the Weald. Figure 2 shows this typical UK onshore well pad.



During the initial period when wells are being drilled, drilling equipment and consumables would need to be stored on site. Once the drilling phase has been completed, the only visible part of the well pad could be the site fence, electrical substation, control panel and the concrete well pad itself. If all wells are drilled sequentially, the total drilling period could last approximately 3 years.

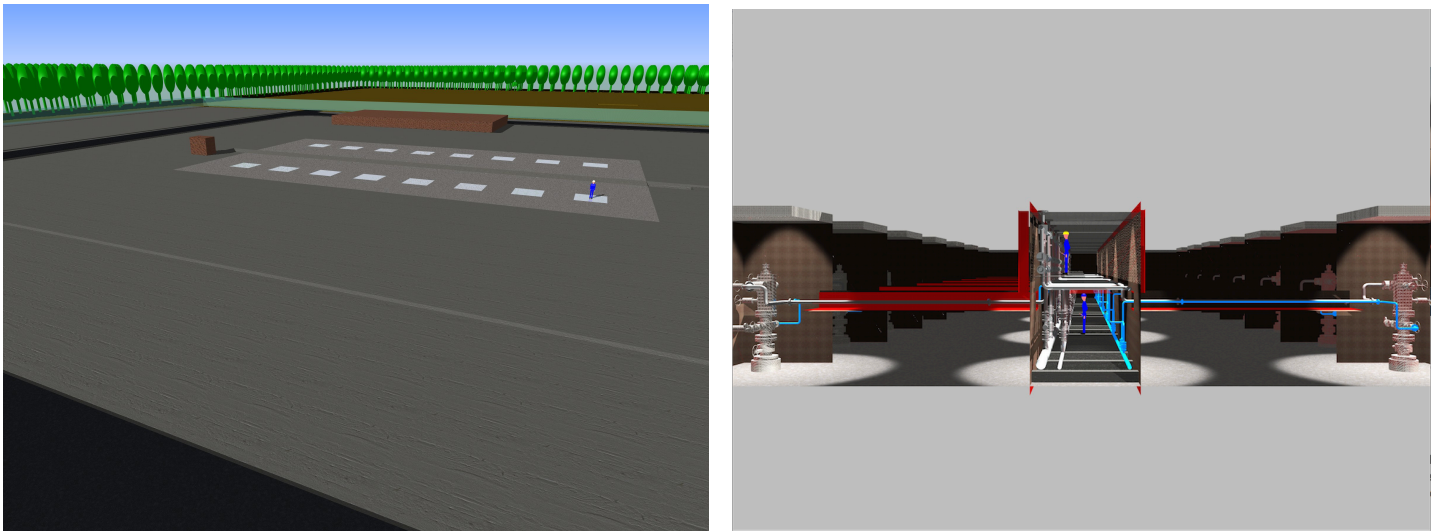


Figure 1 – Low visual impact facility - well pad post drilling and underground production manifold

The design of the production processing facility (see Figure 3) will depend on the composition of the well fluids produced, in particular on the amount and quality of any associated gas. It is proposed that produced well fluids are heated and then degassed and dewatered in a single three phase separator, at low pressure. The elevated temperature and long separator residence time ensures that export oil specifications are achieved. If there are no further contaminants, the crude oil is stored in tanks ready for loading onto road tankers for export. Chemical injection of inhibitors may be required if the produced oil contains wax.

Tankers are loaded with crude in the export loading bays. At the estimated peak production, of around 2,500 bopd, the facility would require approximately 8 trucks per day (one truck every three hours) to transport produced oil to the nearby Fawley oil refinery. Within three years of initial production, the amount of truck movements would reduce to about half that required during peak production, i.e. a road tanker every six hours. Over the estimated 30-year life of a multi-well pad, it is expected that the number of road tankers will average less than one every two days.

It is proposed that the produced water is cleaned and filtered before being re-injected into the reservoir via one or more dedicated water injection wells. The use of an on-site injector removes the necessity to truck produced water and thus reduces traffic impact. Oil entrained in the produced water is removed as well as sand and solids. Additional fine filtration is required due to the anticipated low permeability of the reservoir

Depending on its quality, the gas may require further treatment before being compressed and used to generate power. Any excess power generated can be delivered and sold into the National Grid.

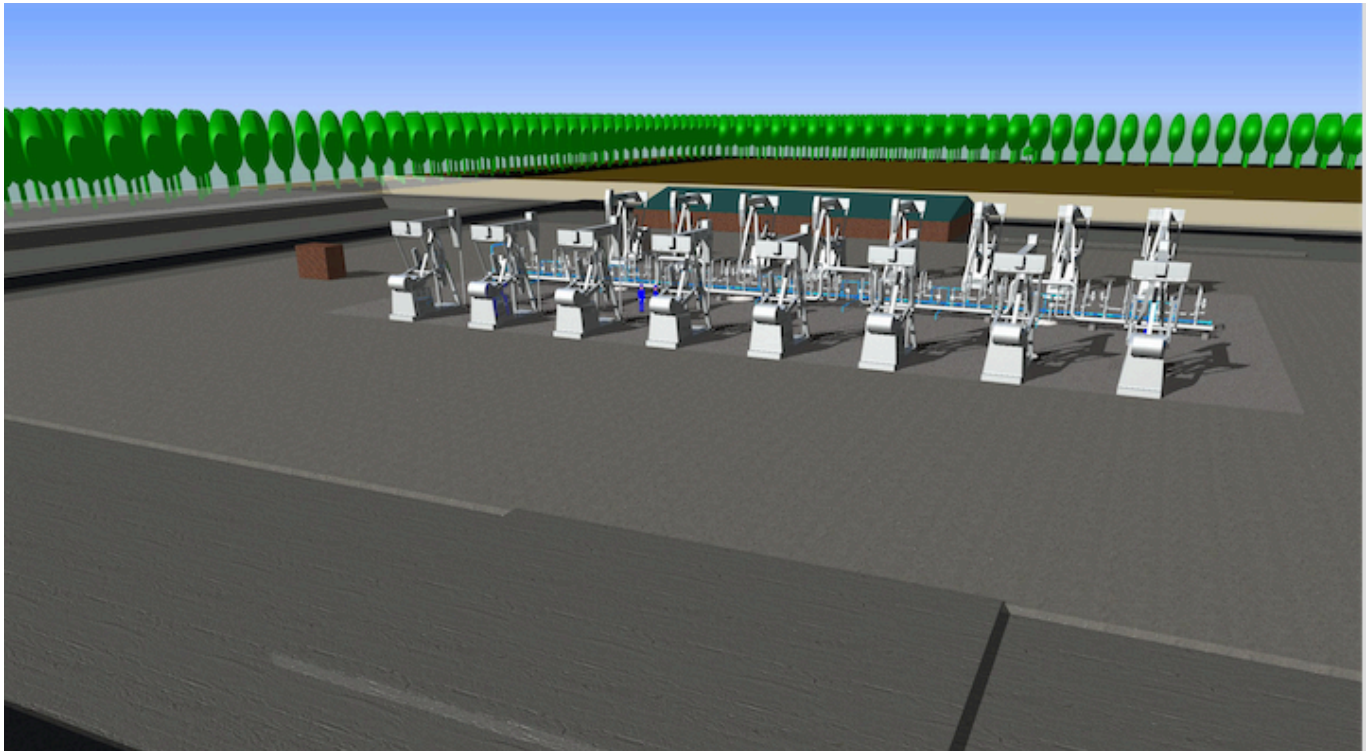


Figure 2 – Typical UK onshore well pad arrangement

Conservative safety margins based on previous experience have been used in the footprint and lay-out of the production processing facility. No specific safety studies have yet been carried out. Once these have been completed, it is envisaged that the footprint area of the production processing facility could be significantly reduced.

Currently, the layout of the multi-well pad covers an area of around 3 acres. The layout of the production processing facility covers an area of around 5 acres.

The study gives an initial view of a possible development concept, based on the criteria provided by UKOG. A more comprehensive study should be undertaken once the forthcoming HH-1 well flow test results are available, allowing for a more detailed design. Nevertheless, the current analysis already indicates that by adopting a more centralised production processing facility approach, linking adjoining multi-well pads, significant cost reductions could be achieved. This scheme would further reduce the overall footprint of any development in the area. Moreover, depending on the quantities of associated gas produced, a gas-to-power solution is likely to be the lowest net cost environmentally acceptable gas handling solution. In future work, alternative gas utilisation strategies should be investigated to maximise gas revenues.

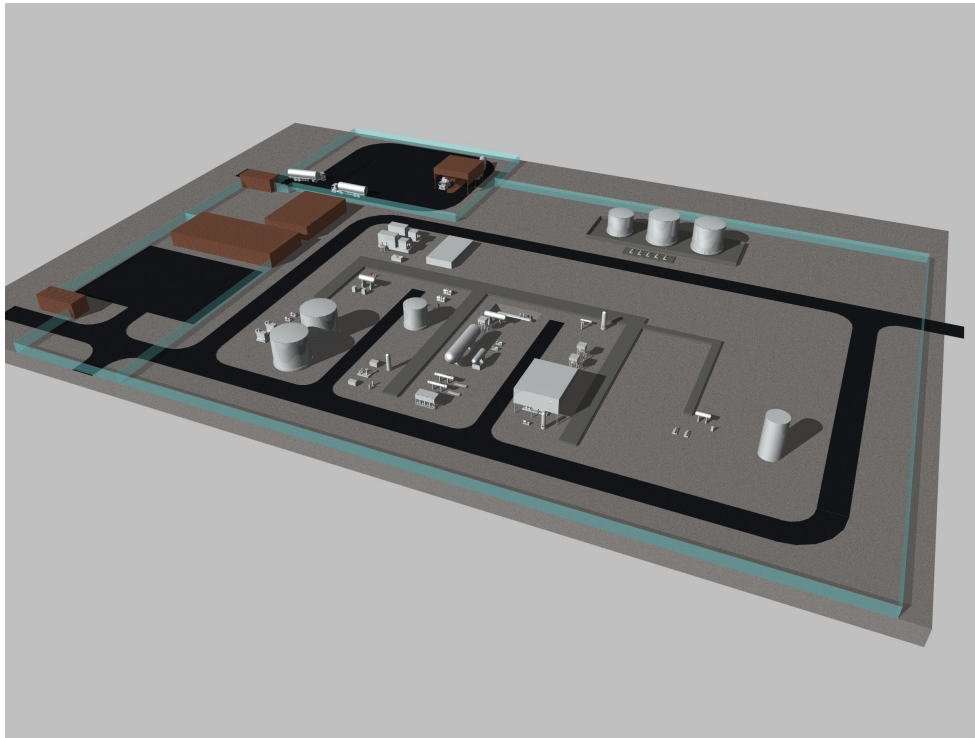


Figure 3 – Production processing facility

### About Xodus Group Ltd

Xodus Group Ltd is a large oil and gas focussed energy consultancy providing integrated subsurface and surface solutions to a global client base. Xodus was established in 2005 and since then has undertaken a large number of projects of various sizes across in most hydrocarbon regions of the world. Xodus staff bring extensive experience in the key regions and basins including the North Sea, West Africa, North Africa, Middle East, South America, and Asia.

The 500 Xodus staff have deep experience in the various technical oil and gas specialisms, including subsurface, wells, flow assurance, risk and safety, environmental, facilities engineering, subsea and pipeline engineering. Next to a historic presence in offshore industry, Xodus has developed a strong onshore capability. In particular, Xodus strength lies in the early stages of field development conceptualisation. Uniquely Xodus has an ability to apply an integrated approach in addressing assets, combining the surface facilities, subsurface and export elements with the local commercial realities.

Xodus serves all upstream oil and gas companies, from super majors, IOCs and independents (including Royal Dutch/Shell, BP, Exxon, Chevron, Maersk, Premier, Nexen, GdF, Dana, CNR, etc.), governments, NOCs as well as smaller operators. Xodus also supports the service industry, from banks to law firms and insurance companies, through to EPC contracting firms.