# FACT AND EVIDENCE-BASED CONSULTATION

Like many sectors, the oil and gas industry generates an enthusiastic and well-meaning following. Many of these followers have no direct experience in oil and gas, or in science or engineering and this can generate discussions, debates and observations that are not always entirely correct. That has certainly been the case here in East Yorkshire in recent months. This space in our information session is designed to address some of the most common misconceptions about our work.

Firstly, it is important to begin with some brief facts:

The work at our current well-site at West Newton is now complete and we remain encouraged by what we have found following our testing programme. All of our work was overseen by Rathlin employees and monitored closely by independent regulators. We have remained consistently compliant with all regulations and conditions of consent in everything that we have done.

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Despite regular visits by the government's independent regulatory professionals, there have been suggestions that we have:

- Breached our health and safety obligations – this is completely untrue.
- Breached our environmental obligations – this is completely untrue.
- Created a well that failed and was unsafe – this is completely untrue.
- Generated noxious and dangerous odours from our site – this is completely untrue. It is fair to say that there have been some localised and intermittent naturally occurring odours that resulted in us implementing a new odour management plan. We brought the matter under control quickly; we were not forced to close the site down as has been suggested.
- Vented gas unsafely and illegally – this is completely untrue.
- Contaminated neighbouring fields and crops – this is completely untrue (and this allegation is potentially damaging to the local farming community).
- Poisoned local wildlife – this is completely untrue.
- Broken environmental and health and safety rules on flaring – this is completely untrue.
- Not communicated about our work – this is completely untrue (please see the information session info-graphic).

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For independent verification, we kindly ask you to contact the Environment Agency, the Health and Safety Executive, East Riding of Yorkshire Council and/or the Department of Energy and Climate Change.

As our attention in the Holderness area now turns to the proposed site of our West Newton B well, please talk to us today about the facts. We really need to draw a line under this inaccurate and potentially libellous commentary that is damaging our reputation and unnecessarily worrying local residents.

## CONSULTATION:

Held 4 public consultation meetings.
Records show that around
**400 people**
attended these meetings at which Rathlin announced its plans for conventional oil and gas exploration (and restated its no hydraulic fracturing commitment).
These were publicised by leaflets, through the parish councils and in the local media

**Visited 35 local residents**

Responded to more **than 320** broadcast and print media enquires

**Carried out 4 site visits** with community liaison members and ward and parish councillors during the drilling phases at both Crawberry Hill and West Newton

**Held 28 community liaison/update meetings** with residents selected by the local communities to represent their interests

Our lead Geologist has given a presentation about our work to more than 50 Yorkshire/Humber civil engineers

Taken community liaison members to see **operational gas and oil fields in neighbouring counties**

Responded to more than **250** letters and emails

NEWS

Distributed more than **60,000** update newsletters, letters and fact flyers

Our Chairman has given **2 presentations** to more than 100 people, including the Humber Energy Institute about our work and plans for the future

We have held meetings with **3 special interest** groups to share details of our plans: Friends of the Earth, Greenpeace and HEY FRACKOFF

## SOCIO-ECONOMIC IMPACT:

**£7.5m spent** in the local economy

Employed more than 50 people locally

Used more than 100 **local companies** to help us deliver our work so far

**Supported 4** local charitable concerns

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# RATHLIN ENERGY

DEPARTMENT OF ENERGY & CLIMATE CHANGE

Rathlin Energy (UK) Limited is a wholly owned subsidiary of Connaught Oil & Gas Limited, a private company with its head office in Calgary, Canada.

Connaught Oil & Gas Ltd is an international petroleum exploration, development and production company with operations in Western Canada and the United Kingdom. The experienced senior management team has an average of 30 years of direct operating experience in Canada and internationally.

The United Kingdom operations are conducted through Rathlin Energy (UK) Ltd and Rathlin Energy Ltd and are directed from the Rathlin Energy office in London. The company is engaged in the exploration and production of petroleum onshore in the United Kingdom and holds a 100% interest in Petroleum Exploration and Development License (PEDL) 183.

This license covers approximately 241,000 acres and was granted by the Secretary of State for the Department of Energy and Climate Change (DECC).

The company is an experienced oil and gas field operator and, through its parent company Connaught Oil & Gas Ltd, has drilled numerous exploration and development wells in Canada. This has been achieved to the satisfaction of all stakeholders and the regulatory authorities which have the responsibility to monitor and supervise petroleum drilling operations. In 2013, Rathlin Energy (UK) Ltd drilled 2 exploratory wells in the East Riding, West Newton and Crawberry Hill. Previously, in 2008, Rathlin Energy Ltd participated in the drilling of Ballinlea-1 in Northern Ireland.

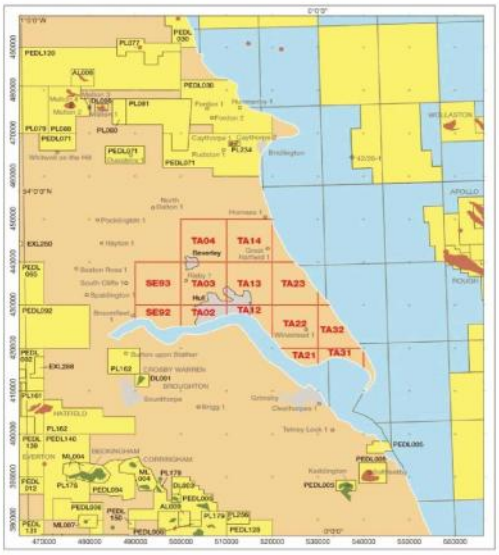
All these wells were drilled safely, without incident, accident or any damage to the environment and without harm to the local community.

Rathlin Energy (UK) Ltd is committed to safe, compliant and environmentally conscious operations for the benefit of employees, contractors, shareholders, stakeholders and the communities in which the company works.

## THE PETROLEUM LICENSING SYSTEM

Ownership of the petroleum resources of the nation is vested in the Crown and the right to explore for and produce petroleum is controlled by DECC, under a licensing system.

Companies are granted a PEDL under the Petroleum (Production) (Landward Areas) Regulations 1995. This license grants the licensee the exclusive right "to search and bore for and get petroleum in (the defined area of the license)". Rathlin Energy (UK) Ltd was awarded PEDL 183 during the 13th Onshore Licensing round in May 2008 by DECC, identified below.




## THE NEED FOR PETROLEUM DEVELOPMENT

The UK is heavily reliant on obtaining energy from fossil fuels and this will continue for a number of years. Oil and gas from the UK currently supplies 60% of the UK's energy needs.

The North Sea oil fields are gradually depleting, having peaked in 1999. It is imperative that this supply is maintained and additional reserves of oil and gas are found. The exploration and development of onshore prospects is becoming increasingly important.

In 2004, the UK became a net importer of oil and gas for the first time; this has continued with increasing demand. The UK is currently importing, on an annual basis, more than 8% of oil demand and over 32% of gas demand. On a typical winter day in 2013, the proportion of imported gas was more than 67% of daily consumption. It is estimated that by 2020, annual import dependence will increase to 45 – 60% for oil and 70% or more for gas.

The UK wishes to ensure security of supply by exploring for indigenous oil and gas reserves both onshore and offshore, where they can be exploited in a safe and environmentally sensitive manner. This has been highlighted in the National Policy Statement for Energy. If the UK does not maintain security of supply, it will become more susceptible to fluctuations in price and volatilities with demand and to the risk of supply interruption to business and industry. Many of the countries which produce significant quantities of petroleum are unstable. Geopolitical interferences could impact on the UK when trying to ensure demand is met.

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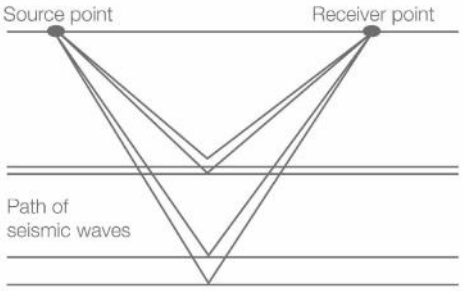
# GEOLOGY AND EXPLORATION

A well location is chosen based on the interpreted geology of the area which identifies a subsurface target. This interpretation is based on a number of datasets such as:

- Regional geological mapping
- Offset well data
- Gravity Surveys
- Aeromagnetic surveys
- 2D and 3D Seismic surveys

Regional geological mapping and offset well data can provide an indication on whether hydrocarbon reservoirs, source rocks and sealing rocks are present in the area.




## SEISMIC SURVEYS

Seismic surveying produces a more detailed image of the subsurface geology. A source is produced at surface which penetrates the subsurface. The signal from the source is bounced off the varying rock interfaces and detected by geophones at surface.

The source is generally produced using small charges loaded in the ground or vibroseis tractor units. Both methods have their advantages in different situations.

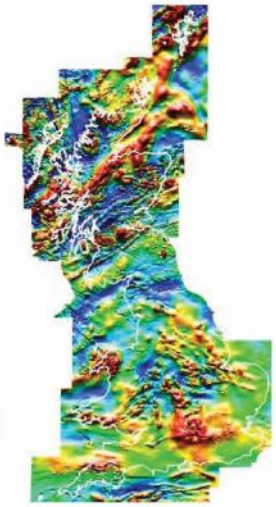
When using charges across country, a hole is drilled, the charge is loaded and then it is backfilled with materials such as gravel or bentonite to allow the source to penetrate into the ground.

To collect the data geophones are placed on the surface along the 2D or 3D lines at set intervals. The geophones, like a microphone, register minute vibrations in the ground. Each source point along the survey line is recorded individually and the data received from each geophone is sent to a mobile recording unit along the survey line. A record is produced of the data received from each geophone for that source point.

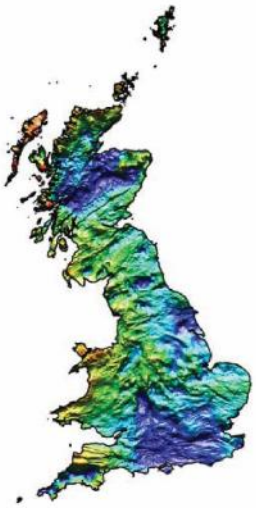

Shot hole drilling rig


Three component geophone

**Aeromagnetic Data** is gathered using a magnetometer flown by an aircraft in a grid pattern. The magnetometer records the differences in magnetic fields as it passes, due to the varying magnetic properties of the rocks below. A magnetic contour map can then be constructed allowing for visualisation of the geological structure.

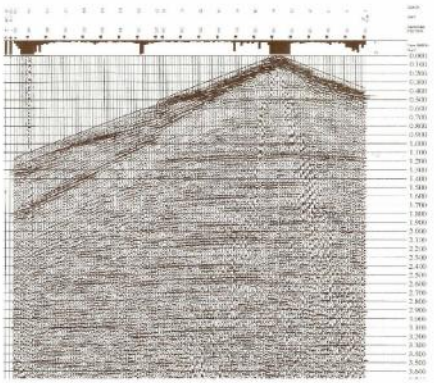

Aeromagnetic data of Great Britain—BGS

**Gravity Surveying**, similar to aeromagnetic surveying, this uses a gravity meter flown in an aircraft above the area. The data shows the difference in the density of the rocks. Although neither of these methods shows the presence of hydrocarbons, the structure of the rocks can give an indication of whether they are capable of trapping and retaining hydrocarbons.


Gravity data of Great Britain—BGS

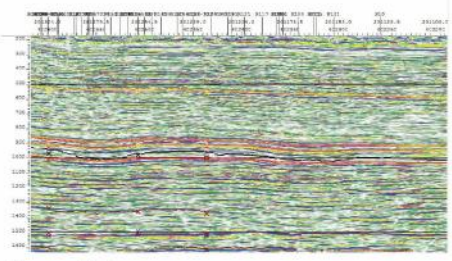
## 2D AND 3D SEISMIC SURVEYS

2D surveys are generally used to select exploratory locations, while 3D surveys provide a more detailed picture of the subsurface. Source points and geophones run along the same line for a 2D survey, whereas lines of source points and lines of geophones run perpendicular to each other across an area for a 3D survey. This means that the source point data is recorded by a greater number of geophones within a radius of the source point. A 3D survey generally covers a smaller area than a 2D survey as there is a lot more equipment needed.


2D Source Point Record

## GEOLOGICAL INTERPRETATION OF SEISMIC DATA

Once all the data has been collected, it is processed so that geological structure and stratigraphy can be interpreted by a geophysicist. From this, it can be determined where possible hydrocarbon reservoirs, traps and seals may exist.


Processed Data

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# PLANNING APPLICATION PROCESS

## SITE SELECTION

The principle limitation to site selection for petroleum wells is the location of the subsurface prospect. A well can only be drilled where petroleum is believed to be likely to occur. Limited information is known about the prospect at this stage and therefore the company will wish to maximise the likelihood of intersecting the prospect and gaining as much information as possible.

Having identified the extent of the prospect, Rathlin Energy has also considered any environmental restrictions. This included statutory designations, local residencies, road infrastructure and environmental data for the area. From this, Rathlin Energy identified a number of possible locations; the one proposed is considered the most acceptable.

## LANDSCAPE

Much of the development will be screened through natural established screening, in addition to the surrounding topography. Effects on the views of local residents will be limited, due to the short term and temporary nature of the proposals. In addition, much of the area is interrupted with intervening hedgerows, woodland and tree cover.

## TRAFFIC AND TRANSPORT

Traffic management has been considered and a number of measures proposed to limit the potential impacts from the proposed operations. This includes the development of a Traffic Management Plan. All contractors will be required to follow this throughout the operations.

## HYDROGEOLOGY

To support the application, a hydrogeological risk assessment was completed. This examined the proposed operations and its potential effects on surface and ground water. A number of mitigation measures are already incorporated into the proposals to ensure the protection of water resources.

## OPERATIONAL TIMELINE

The table to the right highlights the projected timings of the operations.

## CONSULTEES

Natural England; East Riding of Yorkshire Council; The Coal Authority; The Wildlife Trusts; English Heritage; Environment Agency

## ECOLOGY

An independent ecological report was produced for the proposed operations; this included a Phase 1 Habitat Survey. The survey looked at local environmental designations and protected species. It reviewed requirements for mitigation, which included measures to protect nesting birds.

## NOISE

A noise survey has measured the existing background noise levels and assessed this against predicted noise levels during the construction and drilling phases. The assessment has indicated that during both the construction and drilling phases, noise levels will be acceptable with only a temporary and minor impact. In addition, the drilling will comply with the guidance set out in NPPF, by achieving a night time noise limit of Laeq (Hour) 42dB(A) at the nearest residential locations.

## CULTURAL HERITAGE

Several heritage assets have been identified in the locality of the site including Burton Constable Historic Park and Garden and the Grade I listed Burton Constable Hall and the associated stables and carriage house. A cultural heritage impact assessment will accompany the planning application and will consider the potential impact on these heritage assets.

## ARCHAEOLOGY

Archaeology has been considered within the planning application through the completion of a desktop study. This discusses any potential archaeology which may be present in the local area.

## INDEPENDENT CONSULTANTS

Rathlin Energy uses a range of expert independent consultants to provide advice and reports on potential effects.

Allenarchaeology; URS; local transport projects; LanArc Design and Planning; Spectrum Acoustic Consultants

**Typical Exploration Program**

| | Week | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
| Site Construction | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mobilisation | | | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | |
| Drilling | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | |
| Demobilisation | | | | | | | | | | | | | | ■ | | | | | | | | | | | | | | | | | |
| Extended Well Test | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | |
| Restoration | | | | | | | | | | | | | | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ |

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# SITE CONSTRUCTION

## SITE PREPERATION

In preparing the site to ensure it is suitable for the proposed operations, the topsoil will be removed. Soil handling will be carried out with reference to well-established engineering guidelines and in accordance with best practice. To perform this work, a range of typical construction vehicles will be required, including an excavator, dump truck, grader and a compactor.

The topsoil will be removed from the development area and stored in an earth bund along the boundary of the site. This will provide visual screening and noise attenuation during the operations. Due to the topography of the site, some of the subsoil will be required to be removed as part of the cut and fill. This is required to create a suitable and level working surface.

## SITE ACCESS

Typically, wellsites will utilise an existing access point such as a field gateway. This may require improvements, including widening to allow vehicles to access the wellsite. The access is designed to allow the safe movement of vehicles in and out of the site and to not block the public highway.

A section of access track adjacent to the public highway is constructed from tarmac. By using tarmac, this will ensure that vehicles can safely drive onto the public highway and minimise debris being carried onto the road.

## LINER, DRAINAGE AND WORKING SURFACE

Once the topsoil has been removed from the site, an impermeable membrane will be laid across the site and heat-welded to ensure integrity. The membrane is similar to the liners used for landfills and is typically made from High Density Polyethylene.

A drainage ditch will be constructed around the perimeter of the site and any surface water directed to the ditch. Surface water captured in the drainage ditch will be removed by a licensed waste carrier for disposal. Stone will be placed on top of the impermeable membrane, creating a stable working surface.

## VEHICLE MOVEMENTS AND PERSONNEL

Site construction will be carried out over a period of 5 weeks. Throughout the construction period, there will be a number of HGV movements associated with a typical construction operation. This will include deliveries of stone, required to construct a suitable working surface. The construction work will be carried out during the hours stated below.

| DAY | TIME |
|---|---|
| Monday to Friday | 07:00 to 18:00 |
| Saturday | 07:00 to 18:00 |
| Sunday and Bank Holidays | N/A |

## CONDUCTOR SETTING

Upon completion of the site construction and prior to the start of the drilling operations, a steel conductor will be set in the top section of the well bore. The top section will be drilled with a waterwell drilling rig, similar to the one shown below. This section will be drilled with air; however, there may be a minimal requirement for water to aid the drilling. Once this section has been drilled, the steel conductor is set in place. This helps to prevent near surface losses and the washout of the drilling cellar which may cause stability issues.

## CELLAR

Within the centre of the site, cellars will be constructed. This forms a containment area from which the well can be drilled, whilst also housing the wellhead. The cellar is constructed from concrete rings, approximately 2,400mm nominal diameter. The impermeable membrane is incorporated into the cellar construction to maintain the integrity of the site.

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# DRILLING

## MOBILISATION AND DEMOBILISATION

Once the site has been constructed and the conductor has been set in place, the drilling rig and associated equipment will be mobilised to the well site. As the equipment is delivered to the site, it is laid out in the required areas. The drilling rig is then rigged up. The demobilisation will be the reverse of the mobilisation, which will occur on completion of the drilling operation and will take approximately one week.

## THE DRILLING RIG

The rig for this drilling programme will be similar or smaller in size to the KCA/Deutag T61 rig. This rig is capable of drilling to the proposed target depth.

While this drilling rig has been identified as being suitable for the operation, it may not be the one used to drill the well. This is due to a number of factors but principally, due to availability.

Once Rathlin Energy (UK) Ltd is in receipt of the necessary permissions to undertake the proposed work then they will try to secure a drilling rig.

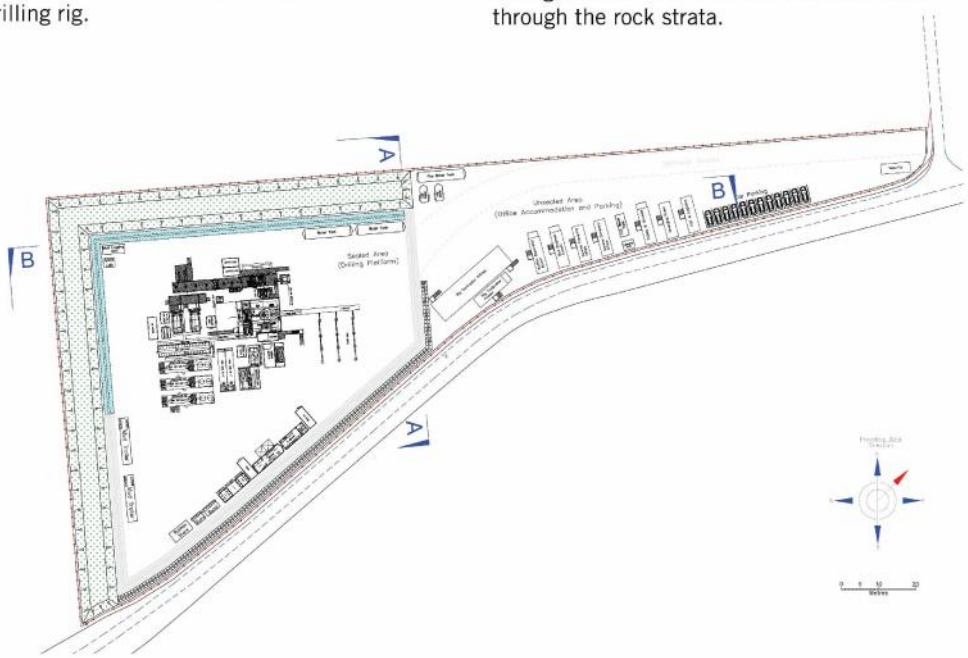
The reason for detailing the KCA/Deutag T61 rig in this planning application is that this will be the largest rig which may be used for the proposed operations. The KCA/Deutag T61 rig is a conventional drilling rig. It has worked in a range of locations throughout the UK and internationally, including locally on both of Rathlin Energy (UK) Ltd previously drilled wells at Crawberry Hill and West Newton. It has a derrick height of approximately 49m which is latticed.

## THE DRILLING OPERATION

Rathlin Energy (UK) Ltd is proposing to drill a borehole to the base Permian section, at a depth of approximately 2,100m, to evaluate the reservoir within the Permian section. It is anticipated that the drilling operation will be completed within 6 - 12 weeks and is required to drill 24 hours a day, 7 days a week. Petroleum wells are typically drilled using rotary drilling. This is an efficient traditional method which employs a vertical derrick, inside which is suspended a column of hollow steel pipe, known as a 'drill string' and a drill bit fitted to its lower end. The 'string' is rotated and the bit cuts downward through the rock strata.

During drilling, a dense fluid known as 'mud' is pumped down the inside of the drill string. The mud lubricates the drill bit and returns to surface fragments of rock which are analysed to identify and correlate the strata through which the bit is passing and for signs of any petroleum within reservoir rocks. An aspect of safety is provided by the hydrostatic weight of the column of mud providing primary pressure control. The mud is designed to exceed any underground pressures, thereby containing them and maintaining the safety of the drilling operation. The rig is also fitted with valves known as "Blow Out Preventers" which act as secondary well control measures and can be closed immediately if an unexpected increase in pressure occurs.

At pre-determined stages in the drilling of a well, the walls of the boreholes are supported by steel casing which is cemented into place. This provides additional safety measures, by preventing the collapse of the borehole as well as isolating and protecting any aquifers. It is essential that drilling continues throughout the day and night to sustain the hole open and maintain control for both safety and operational reasons. Upon completion of the drilling and preliminary testing, the drilling rig will be demobilised.



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# WELL TESTING

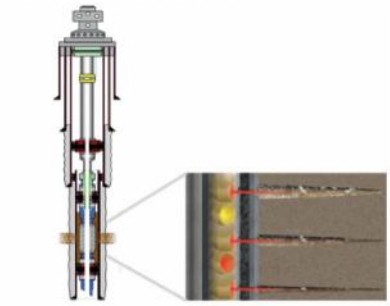
If results from the drilling operation have been encouraging, well tests may be undertaken. Details of the well testing operations will be based on the formations being tested. However, for the purpose of this presentation, this example is consistent with the West Newton B conventional Permian carbonate reservoir targets.

## MOBILISATION AND DEMOBILISATION

Depending on the nature of the well test, the main drilling rig may have been demobilised from site prior to commencing well testing. The main elements of the equipment required for the well testing operation, which may include workover rig and/or coil tubing unit will be mobilised to site over a period of 2 – 3 days. Additional equipment deliveries will be made during the well testing operation, based on operational requirements. Following completion of the well testing operation, all equipment will be demobilised from site.

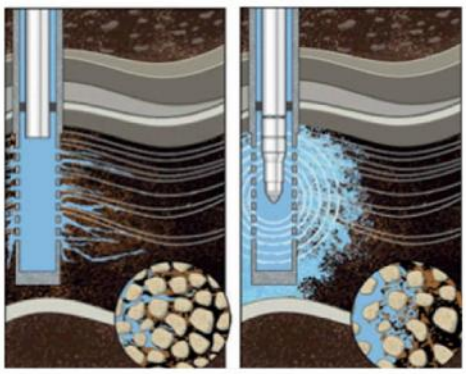
## CASING PERFORATION

In order to establish communication between the reservoir formation and the wellbore, perforating guns will be run into the wellbore and fired, providing a direct pathway from the formation to the wellbore.



## ACIDISATION TREATMENT

An acidisation treatment may be applied to 'clean up' the perforations and near wellbore area to remove damage from drilling and cementing and allow for improved flow. Water abstraction wells can be treated in this same manner to enhance water flow to the borehole.



The acid (HCl) reacts with the limestone ($CaCO_3$) to produce carbon dioxide gas ($CO_2$), water ($H_2O$) and Calcium chloride ($CaCl_2$), a non hazardous salt.

## DRILL STEM TESTING

A drill stem test is a short-term flow test conducted while the main drilling rig is onsite, to obtain an initial understanding and characteristics of both the petroleum and the formation within which it has been encountered. A drill stem test will establish whether the formation is capable of flowing petroleum, the flow rates and pressures. Data obtained during the drill stem test may be used to establish a programme for an extended well test.

During the drill stem test, a flare will be present on site to flare any natural gas associated with the petroleum being flowed to surface. The size and type of flare will be dependent on whether oil or gas is being flow tested.

The duration of a drill stem test is approximately 2 - 3 days.

## EXTENDED WELL TEST

If preliminary drill stem tests prove successful then an extended well test may be undertaken. The extended well test will be designed on the information obtained during the drill stem test and will be specific to either oil or gas.

The purpose of the extended well test is to understand how the reservoir containing the petroleum will perform over a longer period of time and establish a meaningful estimate of potential reserves.

Where oil is being flow tested, a pumping unit (nodding donkey) will be mobilised to site, together with a three phase separator, a flare unit and fluid storage tanks. Oil may be lifted to surface together with natural gas and formation water. The formation fluid is passed through a three-phase separator, where it is separated.

Oil and formation water are diverted separately to storage tanks for subsequent offsite sale and disposal. Natural gas is diverted to the flare for incineration. An extent well test for oil may be undertaken for a period of up to 90 days, 24 hours a day.

Where natural gas is being flow tested, a three-phase separator, a flare unit and fluid storage tanks will be mobilised to site. The formation fluid is passed through a three-phase separator, where it is separated. Oil and formation water are diverted separately to storage tanks for subsequent offsite sale and disposal. Natural gas is diverted to the flare for incineration. An extended well test for natural gas may be undertaken for a period of up to 14 days 24 hours a day.

## INCINERATION OF NATURAL GAS

Whether the petroleum being tested is oil or gas, the natural gas needs to be disposed of safely. As this is an exploratory well, there is unlikely to be any facility available to capture and utilise the natural gas, therefore the only safe method of dealing with the gas is through incineration. The anticipated quantity of natural gas for incineration will dictate the type, size and number of flare units to be in operation during the well test. The flare(s) will be enclosed ground flares or enclosed incinerators.

## VEHICLE MOVEMENTS AND PERSONNEL

As this is an exploratory well, the vehicle movements and number of personnel associated with the well testing phase, including mobilisation and demobilisation of equipment, cannot be determined with certainty. In general, the equipment required to test the well is substantially less that that required for the drilling operation.

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# SITE RESTORATION

On completion of the drilling and following a period of testing, the company will make a decision as to whether the prospect is commercially viable. If a successful production test is achieved, further development will be dependent on a planning application being submitted to the MPA for permission to produce petroleum.

If the well is not commercially viable, then the well will be abandoned and the site restored to its previous condition. This will consist of three principle phases, detailed below.

## ABANDONMENT

The well will be abandoned in accordance with industry best practice and Oil and Gas UK guidance. Mechanical plugs and cement plugs will be set in the well bore and within the steel casing. The casing will then be cut approximately 1.5 metres below ground level and a steel plate welded to the remaining casing stub.

## RESTORATION

The restoration phase will be the reverse of the construction phase. The work will be carried out from Monday to Saturday, from 07:00 to 18:00. All equipment will be removed from the site and the area will be reinstated. Where possible, waste will be recycled, however where this is not possible waste will be disposed of at a licensed waste disposal facility.

The restoration will include the replacement of the soils, which will have been stored in earth bunds around the perimeter of the site. This will be carried out in accordance with best practice guidance.

## AFTERCARE

Following completion of the restoration phase, the Planning Authority will be invited to inspect the site operations to ensure that the work meets with their approval.

An aftercare programme will be undertaken over a period of five years. This will ensure the successful restoration of the land to its previous condition.

Before

After

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# QUESTIONS AND ANSWERS

## Q. WHY WAS THIS LOCATION SELECTED?

A. This location was selected due to its proximity to the subsurface target in addition to balancing a number of environmental and social factors.

## Q. HOW HAS RATHLIN ENERGY CONSIDERED THE POSSIBLE ENVIRONMENTAL IMPACTS?

A. Prior to the submission of the planning application, Rathlin Energy commissioned a number of independent reports. This included assessments on ecology, noise, archaeology and hydrogeology. This allowed the company to identify any potential impacts.

## Q. WHERE WILL THE DRILLING CREW STAY?

A. The Drilling Supervisor, Toolpusher and Mud Engineer will remain onsite 24 hours a day throughout the operations. All other drilling crew members will stay in local accommodation, close to the site.

## Q. WILL THE WELL TARGET SHALE GAS?

A. No, the targets of the well are the conventional petroleum reserves in the Permian Carbonate section. The well will not be drilled deep enough to encounter the Bowland shale.

## Q. HOW WILL ANY AQUIFERS BE PROTECTED?

A. While drilling through aquifers, water-based drilling mud will be used. The well will then be cased in steel and cemented back to surface where it will then be pressure tested to confirm integrity.

## Q. WHY DO WE REQUIRE INDIGENOUS OIL AND GAS DEVELOPMENT?

A. The UK is heavily reliant on obtaining energy from fossil fuels and this will continue for a number of years. In 2004, the UK became a net importer of oil and gas for the first time; this has continued with increasing demand. The UK is currently importing 8% of oil and 32% of gas. It is estimated that by 2020, import dependence will increase to 45 – 60% for oil and 70% or more for gas. If the UK does not maintain security of supply it will become more susceptible to fluctuations in price and volatilities with demand.

## Q. DOES RATHLIN ENERGY REQUIRE PLANNING PERMISSION TO CARRY OUT ITS OPERATIONS?

A. Under the Town and Country Planning Act 1990, Rathlin Energy is required to secure planning permission from the Minerals Planning Authority (MPA) as well as permits from the Environment Agency. For the purposes of the next well, the East Riding of Yorkshire Council is the MPA. Rathlin Energy has only applied for exploratory drilling and any subsequent development will require a new planning application.

## Q. WHAT WILL BE THE VISUAL IMPACT OF ANY OPERATIONS?

A. The visual impact of the proposed operations will be limited due to the temporary and short term nature of the proposals.

## Q. WHAT ARE THE QUALIFICATIONS OF THE PROJECT TEAM?

A. Members of the project team have a great deal of experience and involvement in oil and gas wells throughout the UK and overseas. However, the proposals go through a number of rigorous third party reviews. This ensures that the proposed operations are performed in the safest manner and in accordance with best practice. Reviews are carried out by an Independent Well Examiner, the Health and Safety Executive and the Environment Agency.

## Q. HOW WILL RATHLIN ENERGY MANAGE VEHICLE MOVEMENTS?

A. Rathlin Energy will implement a traffic management plan during the operations. This will require all vehicles associated with the proposals to follow specified routes.

## Q. WHAT NOISE WILL BE GENERATED FROM THIS DEVELOPMENT?

A. Noise levels at the nearest sensitive receptors are predicted to be very low and this was a factor in the selection of the site. Maximum noise levels are set by law.

## Q. FUTURE DEVELOPMENT

A. Any future development of the site will require a new planning application. The planning application submitted will allow us to identify whether petroleum is present and if there is, whether it is commercially viable. Whilst this application is only for an exploration site, we have given consideration to this site being suitable for longer term production of petroleum if Rathlin Energy did wish to produce from this site.

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# DRILLING AND WELL ENGINEERING

The drilling of a petroleum well is a carefully planned and engineered project. A great deal of time is spent by engineers developing a drilling programme which must then be reviewed by a number of independent third parties.

The drilling programme ensures that the well is drilled in the safest possible manner and in accordance with best industry practice.

Engineers use data from previous wells drilled in the local area and into similar formations to ensure that all relevant factors are taken fully into consideration.

Where a well is drilled through any aquifer, special measures are incorporated into the design of the well to ensure that any aquifers are isolated and protected.

## DRILL BITS

The drill bit is the cutting or boring tool which is rotated by the drill string. This rotation allows the bit to cut downward through the rock strata. Drilling mud is circulated through the bit and allows the recovery of cuttings to the surface. Different drill bits are selected based on the different strata being drilled.

Insert Bit

PDC Bit

Milled Tooth Bit

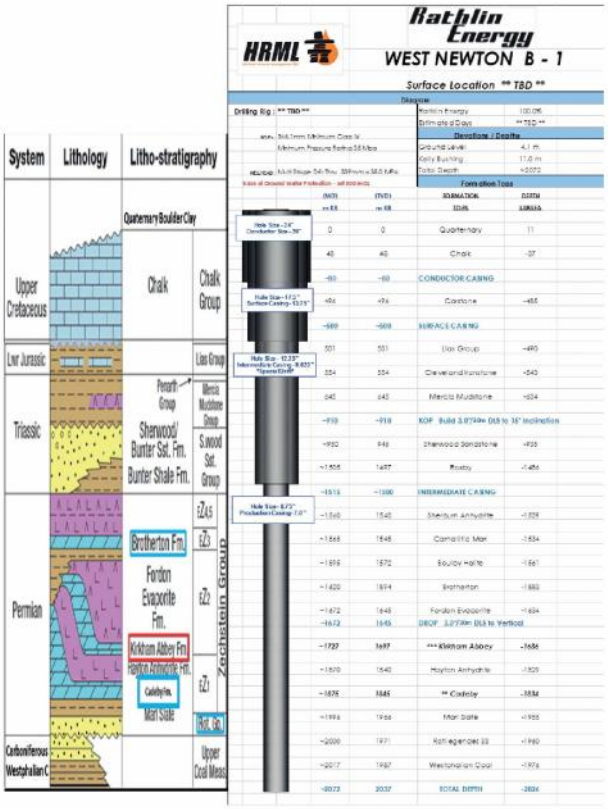
## CASING

Wells are drilled in a number of sections of different diameters, with each section being sealed by steel casing and cement. At pre-determined stages in the drilling of a well, the walls of the borehole are supported by steel casing which is cemented into place. This provides additional safety measures, by preventing the collapse of the borehole and the ingress of groundwater under pressure.

## WELL CONTROL

**PRIMARY WELL CONTROL** — Primary well control is provided through the use of drilling muds. The hydrostatic weight of the column of mud provides primary pressure control, which is designed to exceed any underground pressures, thereby containing them and maintaining the safety of the drilling operation. Drilling mud weight will be targeted to provide a minimum of 100psi overbalance on anticipated formation pressure.

**SECONDARY WELL CONTROL** — Secondary well control will be provided by a diverter system. Secondary well control in all hole sections below the Top Permian will be provided by a double ram BOP and an annular. The BOPs are tested regularly and will be rated to a minimum of 5,000psi and be suitable for gas service. The well head system will be rated to a minimum working pressure of 5,000psi and be suitable for gas service.



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# TRAFFIC AND TRANSPORT

All vehicles accessing the wellsites will be required to follow a prescribed route. Based on the size of the wellsite to be constructed for the drilling of the well, an assessment of the expected vehicle movements has been made. The assessment, shown below, is based on the typical amount of materials required to construct the site and how this material is transported.

Prior to any work commencing onsite, a traffic management plan will be developed as a key part of the planning application which will specify the route all vehicles associated with the project must follow. Agreement to comply with the approved vehicle route will form part of the service agreement between the company and the construction company. At the equipment ordering stage, all companies delivering equipment to the site will be instructed about the approved vehicle access route and will be required to adhere to this. A copy of the access route will be attached to every purchase order that is issued for equipment.

| | Description | Area to Cover | Roll Length | Roll Width | No. per Truck | No. Trucks | Truck Type |
|---|---|---|---|---|---|---|---|
| | **Preliminary Works** | | | | | | |
| | Welfare Unit | N/A | N/A | N/A | 1 | 1 | Rigid Hiab |
| | 360 Excavator | N/A | N/A | N/A | 1 | 1 | Low Loader |
| | Diesel Tank | N/A | N/A | N/A | 1 | Included Above | |
| | Dumper Truck | N/A | N/A | N/A | 1 | 1 | Rigid Ramp |
| | Roller | N/A | N/A | N/A | 1 | Included Above | |
| | **Access Construction** | | | | | | |
| | Mini Digger | N/A | N/A | N/A | 1 | 1 | Rigid Ramp |
| | Roller | N/A | N/A | N/A | 1 | Included Above | |
| | Concrete Kerb Blocks | N/A | N/A | N/A | All | 1 | Rigid Hiab |
| | Tarmac | 180m2 | N/A | N/A | 16 Ton | 5 | 16 Ton Rigid 6 Wheeler |
| | **Cellar Construction** | | | | | | |
| | 2.4m ID Concrete Cellar Ring | 2 x 3.5m deep (8 x 1m rings) | 1m | 5.66m | 4 | 2 | Rigid Hiab |
| | Concrete | 6m3 per cellar | N/A | N/A | 6m3 | 2 | 6 Wheeler Concrete Mixer |
| | A393 Mesh | Base of Cellar | N/A | N/A | 1 | 1 | Rigid Hiab |
| | **Perimeter Ditch** | | | | | | |
| | Twin Wall Pipe | 171m | N/A | 6m | All | 1 | Rigid Hiab |
| | Twin Wall Elbows | 3 | N/A | N/A | All | Included Above | |
| | 40mm Single Size Stone | 171m | N/A | N/A | 19.5 ton | 10 | 20 Ton Rigid 8 Wheeler |
| | 1m backfill = 1m3 | | | | | | |
| | **Site Liner / Geogrid** | | | | | | |
| | Geotextile (Sub Layer) | 6510m2 | 80m | 5m | All | 1 | Curtain Sider |
| | Liner | 6510m2 | 80m | 5m | All | 1 | Curtain Sider |
| | Geotextile (Sub Layer) | 6510m2 | 80m | 5m | All | 1 | Curtain Sider |
| | Geogrid | 6510m2 | 50m | 4m | All | 1 | Curtain Sider |
| | **Stone** | | | | | | |
| | 300mm Thick Type 1 Stone | 6510m2 | N/A | N/A | 19.5 ton | 200 | 20 Ton Rigid 8 Wheeler |
| | Stone Total = 1953m3 x 2 ton per m3 (stone weight) = 3906 ton | | | | | | |
| | **Fencing** | | | | | | |
| | Post Fencing | 367m | N/A | N/A | All | 1 | Rigid Hiab |
| | 100mm Galvanised Mesh | 367m | N/A | N/A | All | 1 | Rigid Hiab |
| | 4m Galvanised Gates | 2 | N/A | N/A | All | Included Above | |
| | **Additional Requirements** | | | | | | |
| | Herras Fencing | 44m | N/A | N/A | All | 1 | Small Rigid |
| | Cellar Cover | 2 | N/A | N/A | All | Included Above | |
| | Fuel | N/A | N/A | N/A | | 2 | 6 Wheel Tanker |
| | Skip | N/A | N/A | N/A | | 2 | Skip Lorry |
| | **Conductor Setting** | | | | | | |
| | Drilling Rig | N/A | N/A | N/A | 1 | 1 | Trailer mounted |
| | Mud Tanks | N/A | N/A | N/A | All | 1 | Articulated Flatbed |
| | Pumps | N/A | N/A | N/A | All | 1 | Articulated Flatbed |
| | Tool Shed | N/A | N/A | N/A | All | Included Above | |
| | Welfare Unit | N/A | N/A | N/A | All | 1 | Articulated Flatbed |
| | Site Security Office | N/A | N/A | N/A | All | 1 | Articulated Flatbed |
| | Telehandler | N/A | N/A | N/A | All | 1 | Low Loader |
| | Drillpipe / Casing | N/A | N/A | N/A | All | 1 | Articulated Flatbed |

Site Construction

## MUD AND DEBRIS

The site is constructed from MOT Type 1 stone, which will be compacted to provide a suitable working surface. Adjacent to the public highway a section will be constructed from tarmac. The access will key into the existing public highway. The access will allow HGV's to stop off the public highway; in addition HGV's can pass in the entrance.

Should mud or debris be carried onto the public highway, then measures will be implemented to remove this, including use of a road sweeper.

## SIGNAGE

Signs directing vehicles to the wellsite will be erected along the prescribed access route. In addition to signs directing drivers to the site entrance, additional temporary signage will be installed along the public highway on both sides of the entrance. This will caution drivers that HGVs are turning and they are approaching a site entrance.



## PARKING

Prior to the start of the construction works, a small area will be designated for parking. This will permit any vehicles to be clear of the public highway. During the drilling and extended well test operations, an area has been designated on site for parking. This will provide sufficient facilities for all personnel. No vehicles will be permitted to park on the verge outside the site at any time.

Visibility from the site access will be maintained at all times.

## DILAPIDATION SURVEY

Prior to the commencement of operations, a condition survey will be completed along the public highway. A record will be made of the road's existing condition prior to any operations commencing and a photographic record completed.

During the operations, ongoing monitoring will be performed to identify any deterioration in the road condition. Should the road conditions deteriorate due to the operations, then a remediation scheme will be implemented.

TRAILER

RIGID HIAB

RIGID SIX-WHEEL WHEEL STONE LORRY

CONCRETE MIXER

CURTAINSIDED TRAILER

LOW LOADER

SKIP HAULER

TANKER

100T CRANE

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# VISUAL IMPACTS

## DURING DRILLING OPERATIONS

The most visual element of the development is when the drilling rig is on site. The drilling rig will be on site for a duration of between six and 12 weeks depending on drilling penetration rates and whether petroleum is encountered.

During the drilling operation, it is necessary for hole stability and well control purposes for the drilling operation to continue 24 hours a day. The drilling rig will be lit at night to ensure a safe place of work for the personnel on site.

## LONG TERM IMPACTS OF PETROLEUM PRODUCTION

While it is not considered part of the planning application for exploration and appraisal of petroleum, a common concern shared by residents is what the site will look like if petroleum is discovered and the company is granted planning permission to produce petroleum.

Planning permission for long-term production of petroleum will include a requirement to submit a detailed landscaping plan, which is to be approved by the Minerals Planning Authority.

Examples of well sites which have been producing petroleum for a number of years, some in excess of 20 years, are shown here, including the Saltfleetby B well site, which is the production facility for the largest onshore UK gas field.

CRAWBERRY HILL - WELL SITE

WEST NEWTON - DAYTIME OPERATIONS

WEST NEWTON - NIGHTTIME OPERATIONS

SALTFLEETBY A – DRILLING 1998

SALTFLEETBY A – GAS PRODUCTION 2002

SALTFLEETBY B – GAS PRODUCTION EQUIPMENT

KEDDINGTON – OIL PRODUCTION 2011

KEDDINGTON – OIL PRODUCTION 2002

KEDDINGTON – OIL PRODUCTION 2002

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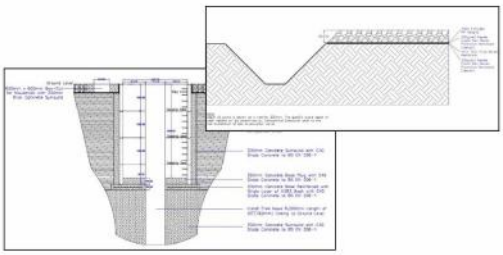
# ENVIRONMENTAL PROTECTION

## ENVIRONMENTAL RISKS

In order to ensure the protection of the surrounding environment, it is essential to first understand which elements of the development represent an environmental risk and the likelihood of any incident occurring.

Best available techniques are then deployed to ensure the potential for an environmental incident to occur is removed. Site designs show the level of environmental protection.



## HDPE IMPERMEABLE MEMBRANE AND PERIMETER DITCH

The whole of the drilling site is constructed to a level plateau with a perimeter ditch surrounding the internal site. The ditch provides a catchment area should an environmental spill occur. A layer of non woven needle punch geotextile is then laid. The purpose of the geotextile is to provide puncture protection from the subsoil below.

The HDPE impermeable membrane is then overlaid on the geotextile across the level site and the perimeter ditch. The roles of HDPE are heat welded together forming a completely impermeable membrane.
Once the HDPE impermeable membrane has been installed and sealed to the drilling cellar, a second layer of non woven needle punch geotextile is overlaid on the HDPE impermeable membrane to provide puncture protection from the stone required to be overlaid in order to create a suitable working platform.

## CELLAR CONSTRUCTION

The purpose of the drilling cellar is to house the wellhead, which is the interface between the casing and the blow out preventers during drilling operations or the production tree during subsequent production. The drilling cellar also provides containment of any drilling fluids which may discharge from the drill pipe when making connections.

The drilling cellar is constructed using pre-cast concrete rings, which are bonded together with Tokstrip sealant. A 200mm concrete surround and concrete base ensures the integrity of the drilling cellar. A leak-off test is carried out using water to confirm the cellar has fluid retaining integrity.

The HDPE impermeable membrane is attached to the outside of the drilling cellar using fixing battens, which provide a tight seal around the drilling cellar.

## AQUIFER PROTECTION

It is vital that aquifers of regional importance are protected during a drilling operation, subsequent production operations and post well abandonment. It is critical, therefore, that the design of the well includes the method by which the well is drilled, to take into account the location of these aquifers and mitigate any potential risk of pollution.

In order to protect the aquifer, a large diameter hole will be drilled using water-based (biodegradable) fluids. Steel casing will then be run and cemented into position. A pressure test is carried out on the casing to confirm it has pressure integrity. The steel casing and the cement around the casing provides an environmental barrier between the inside of the casing and the aquifer.

The second hole section will be drilled using water-based (biodegradable) fluids, through the Sherwood Sandstone formation which is also an aquifer of regional importance. Casing will be run and cemented into position. A pressure test is carried out on the casing to confirm it has pressure integrity. The steel casing and cement around the casing will provide an environmental barrier between the inside of the casing and the Sherwood Sandstone formation. It will also provide additional barriers across the aquifer above.

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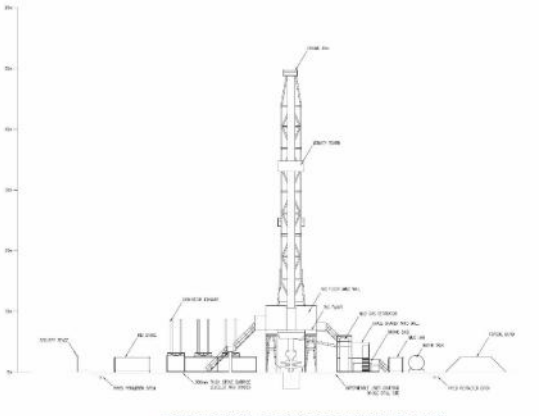
# WEST NEWTON B WELLSITE
# PERMIAN CARBONATE TEST
# ESTIMATED TOTAL DEPTH - 2,100M

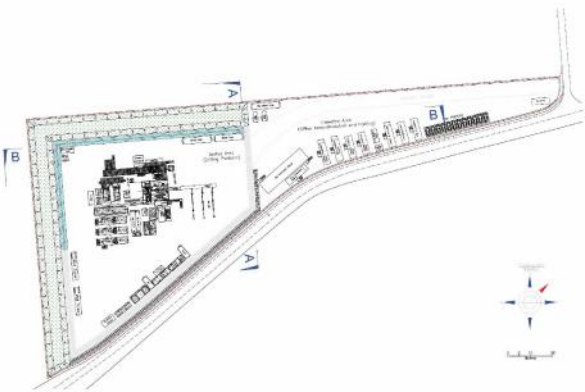
In 1971, BP drilled the Great Hatfield-1 well 6.2km north of the proposed West Newton B location. The Great Hatfield-1 well was drilled to a total depth of 2,298m, into the Westphalian Carboniferous Coal Measures - there were no hydrocarbons visible.
In 1972, Candecca drilled the Winestead-1 well, 14.7km south east of the currently proposed location, to a total depth of 2,004m into the Westthalian Coal Measures. Neither of these wells encountered commercial quantities of oil or gas. Other drilling activity in the area includes the multiple deviated gas storage wells that have been drilled from the SSE site near Aldborough about 5.9km east of the currently proposed location. The gas storage wells are drilled to depths of approximately 1,900m into the Permian salt section.

In 2011, Rathlin Energy conducted a 2D seismic survey to delineate a geophysical lead that had been identified on legacy 2D seismic data, acquired in the 1980s by other industry operators. In 2013, based on the 2D seismic acquired in 2011, Rathlin Energy drilled the West Newton-1 well to a total depth of 3,150m into the Dinantian Carbonate section of the Carboniferous. The testing of this well has recently been completed. The shale in the deeper part of the well has been plugged with cement and no further evaluation of that formation will be undertaken. The test was focussed the conventional Permian Carbonate reservoir.

In the proposed West Newton B well, Rathlin Energy recognises up to three potential reservoir target horizons. These include the Permian age Brotherton, Kirkham Abbey and Cadeby formations. These formations will be encountered at depths ranging between 1,500 – 2,000m. The wells estimated total depth will be approximately 2,100 metres. The West Newton B well will not drill to or test any deeper formations such as the Bowland shale which would be found at a depth of over 2,900m.

INDICATIVE SECTION A-A THROUGH DRILL RIG & DRILL SITE (1:200)



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# RATHLIN ENERGY AND GOVERNMENT REGULATORS

## Rathlin Energy

Rathlin Energy is committed to ensuring that practical and effective measures are used to:

- Protect the health and safety of the company's employees, contractors and the public;
- Safeguard the environment;
- Comply with all relevant Health, Safety and Environmental (HSE) legislation.

Management is responsible for, and is dedicated to, the implementation of the company's HSE protection responsibilities. Management will also ensure that all the equipment, training and procedures required for compliance with applicable legislation and the Petroleum Industry's Guiding Principles are provided.

Operations personnel, at all levels, are expected to participate in the development of the company's ongoing HSE initiatives. Operations personnel are also expected to comply with all applicable rules and procedures as identified in applicable legislation and company documentation.

A continuous joint effort by management, employees and contractors will ensure a safe, healthy and clean work environment.

## Department of Energy & Climate Change

Licensing Authority for the exploration and production of Petroleum.
Assesses operator competency based on:

- Technical experience
- Management and supervision capability
- Operator's assessment of risk and decision making
- Public engagement
- Financial capability
- Insurance provisions

In certain cases, DECC will seek independent verification on the above.
Issues consent for activities associated with exploration and production of petroleum under Well Operations Notice (WONs). WONs consent is contingent upon the Operator having first obtained appropriate planning permission.

## Environment Agency

Determines and issues permits for Rathlin's site operations including its Waste Management Plan as well as monitoring and enforcing permit terms.

Environmental Regulator for the exploration and production of petroleum. Mitigates risk to the environment by:

- Consultation with stakeholders
- Technical review and approval of activities through EPR2010
- Monitors compliance of the permitted activities under EPR2010
- Independent monitoring

## EAST RIDING OF YORKSHIRE COUNCIL

Determines and issues Planning Permission and sets, monitors and enforces conditions.

**Minerals Planning Association**

Planning Regulator for the exploration and production of petroleum with respect to appropriate land use.

It mitigates the impact of the development by:

- Consultation with stakeholders
- Review and approval of activities under the Town and Country Planning Act
- Controls the impact of the development through planning conditions
- Monitors compliance of the permitted development, including site restoration

## HSE Health and Safety Executive

Health and Safety Regulator for the exploration and production of petroleum. Undertakes its duty by implementing regulations, monitoring and inspecting operations. For example:

- Independent verification of well design through Regulation 18 of DCR
- Technical review of well operations through Regulation 6 of BSOR
- Monitors activities through weekly operator reports
- Periodic inspections of well operations
- Maintain close relationship with operators

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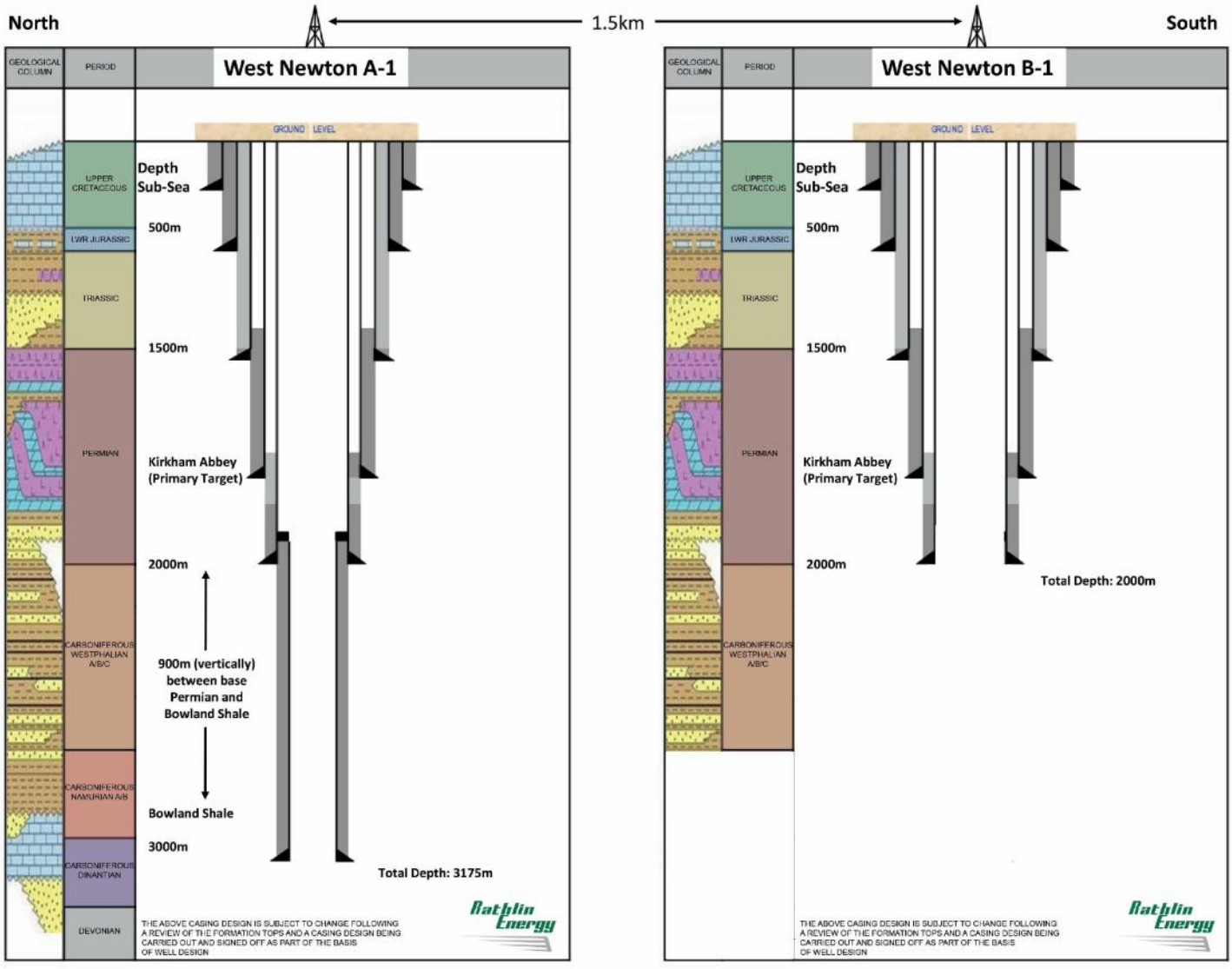
# SITE AND ACCESS PLAN

# GENERIC WELL DESIGN




Not to scale

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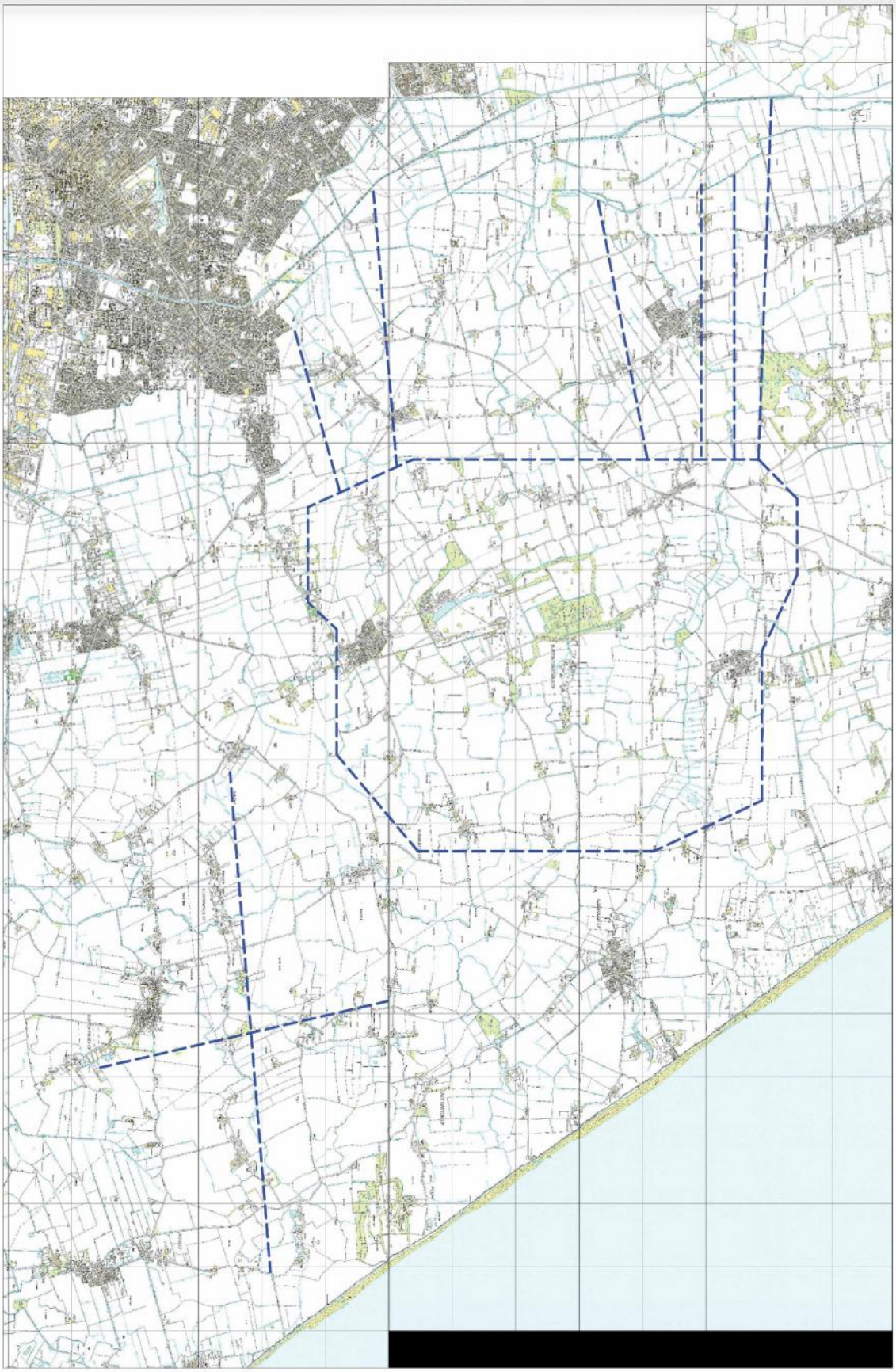
# SEISMIC SURVEY AREA



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# EXISTING ONSHORE OIL AND GAS FIELDS