

Statement of Community Involvement

Altcar Moss Wellsite

June 2019



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1. INTRODUCTION

1.1 Statement of Community Involvement

This Statement of Community involvement has been produced to accompany a planning application for the Altcar Moss wellsite submitted to Lancashire County Council (Minerals Planning Authority) under the Town and Country Planning Act 1990 and the Compulsory Purchase Act 2004.

The Applicant is proposing to construct a wellsite, of approximately 1 hectare in area, within which it will drill and core a vertical borehole, followed by the drilling of a second borehole, with a horizontal section approximately 1,500m in length. Both boreholes will then undergo hydraulic fracture stimulation. Each borehole will then be separately flow tested and, subject to the results obtained, the horizontal borehole may then undergo an extended well test (up to 90 days). In the event that the exploratory works are unsuccessful, both boreholes will be decommissioned and the site restored. If successful, any future planned works would be subject to a separate planning application. For clarity, stimulation of the boreholes will involve high volume hydraulic fracture stimulation, as defined by Section 4B(1) of the Petroleum Act 1998.

The planning application is supported by an Environmental Statement.

1.2 The Applicant

Aurora Energy Resources Limited (the Applicant) is a private UK company engaged in the exploration for oil and gas in North West England. It is the operator of Petroleum Exploration and Development Licences (PEDLs) 164, 261, 262 and 267.

The Applicant is currently evaluating the hydrocarbon potential within PEDL 164, with specific emphasis on the Bowland Shale/Hodder Mudstone sequence. Having acquired a new 3D geophysical survey across an area of interest within PEDL 164 in 2016, the Applicant is now proposing to drill and test two (2) exploratory boreholes from a site located at Sutton's Lane, Great Altcar, Lancashire. Hereafter referred to as the Altcar Moss wellsite.

1.3 Context for Communications and Consultation

Oil and gas operations in the local area have a history extending back almost 80 years to the exploration, appraisal and subsequent production of the Formby oilfield.

The Applicant has held Petroleum Exploration and Development Licences 164 since 2008 and has conducted previous operations in the licence area including the acquisition of a 3D geophysical survey, covering approximately 50 km², in 2016.

In recent years the context around the public acceptance of onshore oil and gas developments has changed as a result of high-profile campaigns opposed to hydraulic fracturing. These campaigns have resulted in the perception of some members of the public that onshore oil and gas operations present a high risk to the environment and potentially to public health. This view is not supported by any of the relevant regulatory bodies.

Notwithstanding the above, the Applicant remains committed to providing local residents, local politicians and businesses, in the vicinity of the company's active or proposed sites, with relevant information in advance of either the submission of planning applications or any planned operations.

2. POLICY BACKGROUND

2.1 Planning Policy, Planning Guidance and Industry Guidance

2.1.1 National Policy

2.1.1.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was enacted in July 2018 and revised the 2014 National Planning Policy Framework. It sets out the Government's planning policies for England and how these are expected to be applied.

With regard to pre-application engagement Paragraph 39 states:

'Early engagement has significant potential to improve the efficiency and effectiveness of the planning application system for all parties. Good quality pre-application discussion enables better coordination between public and private resources and improved outcomes for the community.'

The guidance continues in paragraph 40 stating with regard to local planning authorities that:

'They cannot require that a developer engages with them before submitting a planning application, but they should encourage take-up of any pre-application services they offer. They should also, where they think this would be beneficial, encourage any applicants who are not already required to do so by law to engage with the local community and, where relevant, with statutory and non-statutory consultees, before submitting their applications.'

2.1.2 Local Policy

2.1.2.1 Lancashire County Council Statement of Community Involvement, amended January 2017

The document sets out the plans of Lancashire County Council for effective community involvement in planning across the county.

The document sets out that :

'Applicants are encouraged to submit a consultation statement with their planning application, which sets out the community engagement already undertaken, including:

- The scale of the notification, including a list of properties and businesses contacted; List of interest/community groups or other organisation contacted;*
- Location and duration of any events held;*
- Summary of all the comments received and issues raised;*
- A clear indication of which comments have resulted in amendments to the scheme and what those changes are, and which comments have not, and why not;*
- Any comments by groups or individuals about the public engagement process.*

The applicant should retain all consultation responses as a record of the measures they have undertaken to ensure effective community involvement. The information gathered may be included in the officer's report when the application is submitted for determination.'

In accordance with national and local policy, extensive consultation has been undertaken with the community, as summarised in this document.

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2.2 United Kingdom Onshore Oil and Gas Group

As members of the United Kingdom Onshore Oil and Gas Group (UKOOG), the Applicant has adopted the organisation's standards for community engagement, as set out in the 2013 UKOOG Community Engagement Charter for Oil and Gas from Unconventional Reservoirs.

Under the Charter, the Applicant has committed to "engage with local communities, residents and other stakeholders at each of the three stages of operations – exploration, appraisal or production, beginning in advance of any operations and in advance of any application for planning permission."

3. COMMUNICATION AND CONSULTATION STRATEGY

The communication and consultation strategy for the application site has been designed to focus on providing relevant information relating to the proposed development to local residents and businesses, and to local politicians. Whilst it is recognised that there is a wider political debate about the role of shale gas developments in UK energy policy, this is not a focus of the communication and consultation strategy which concentrates on providing information to the above stakeholders as context to the proposed development.

When planning the ongoing communications and consultation activity, the Applicant's guiding principle has been to be transparent, open to questions from local stakeholders and to provide as much information as possible about the proposed project. The importance of providing multiple avenues for local stakeholders to obtain information and ask questions about, and provide feedback on, the proposed development in person, by phone or email or via the Applicant's website is recognised.

The Applicant's strategy is therefore to:

- Provide timely notification of key project events including the submission of the scoping request and of the public information events to all local residents and businesses within 1.5km of the Site, the local MP, local politicians (County and Borough councillors) in whose ward the Site is located and the two parish councils adjoining the Site;
- Create opportunities for local stakeholders to meet face to face with the Applicant via a series of public information events to ensure :
 - they can obtain information about each stage of the proposed development
 - they have the opportunity to ask a range of questions about the proposed development
 - the Applicant can listen to and understand any concerns local stakeholders have and the reasons behind their questions and can therefore provide detailed answers where possible, including to any follow up questions; important when discussing technical subjects;
- Make available information relevant to the proposed development, including the materials presented at the public information events, and guidance as to the regulatory environment for onshore oil and gas operations via the company's website;
- Provide further routes for local stakeholders to contact the Applicant via the provision of project-specific email and telephone contact points and via the Applicants website.

4. PUBLIC ANNOUNCEMENT OF THE PROJECT

The Applicant submitted a scoping request to Lancashire County Council on 4th January 2018. On the same day, letters identifying the proposed Site and outlining the proposed development were sent to all local residents and businesses within 1.5km of the Site, the local MP, local politicians (County and Borough councillors) in whose ward the Site is located and the two parish councils adjoining the Site.

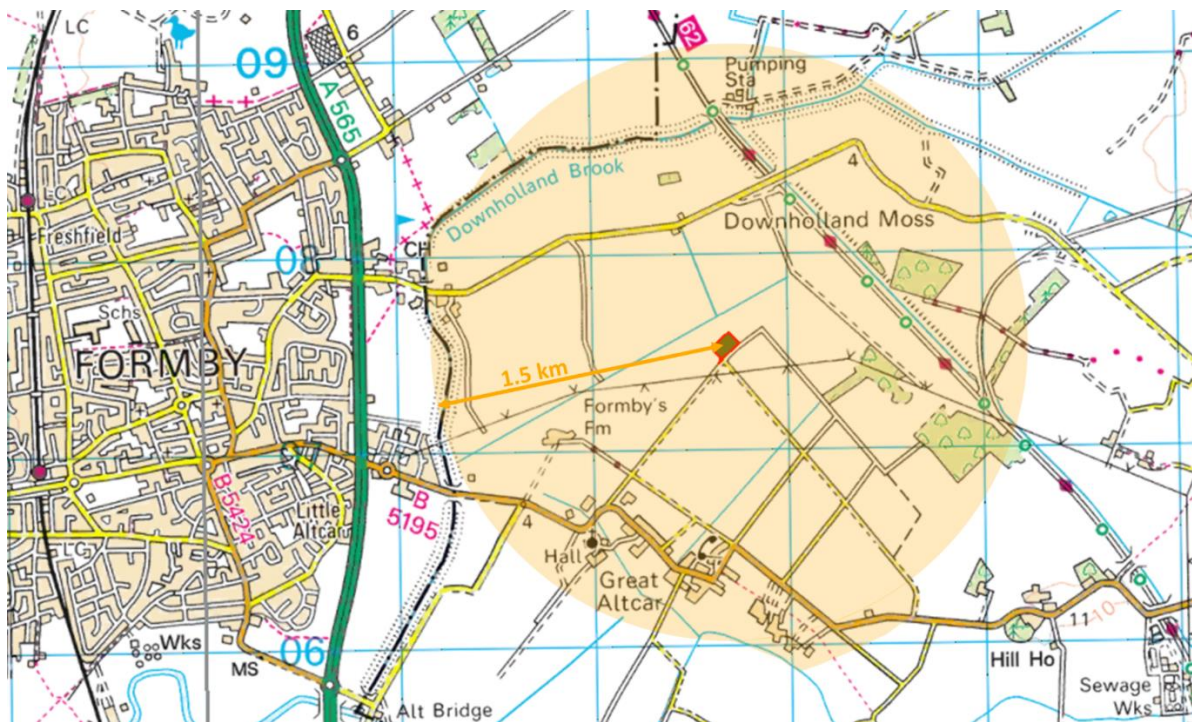


Figure 4.1 Local Community Area (1.5km from site)

5. PUBLIC INFORMATION EVENTS

Two public information events have been held in Haskayne Village Hall, the nearest suitable venue to the Altcar Moss Wellsite. Local residents, the local MP, local politicians and parish councils were informed by email or by post of the location and time of these events which were additionally advertised in the local press.

The first public information event was held on 17th February 2018 and ran from 12:00 until 18:00. The event was well attended with 166 people registered as attendees.

A series of display boards set out the proposal, the Applicant's project team were present at the event, allowing members of the public the opportunity to ask questions and seek clarification on the project.

The second public information event was held on 2nd November 2018 and ran from 16:00 – 19:30. As with the first event, information was presented on display boards with the Applicant's project team being present, allowing members of the public the opportunity to ask questions and seek clarification on the project. This second event was able to present the findings of the various surveys and studies undertaken to support the Environmental Impact Assessment. Some 91 people registered as attendees at this event.

The Applicant sought feedback from attendees at each of the above events by means of a paper comments form and also direct to the dedicated project email address or by phone to the project information line.

5.1 Promotion of the Public Information Events

A number of routes were used to advertise the public consultation events.

5.1.1 Newspaper Advertisement

Advertisements were published in the following newspapers detailing the time and location of the public information events:

First Public Information Event:

Week 6 commencing 5 February: Formby Champion, Ormskirk Champion, Southport Visiter

Second Public Information Event:

Week 43 commencing 22 October: Formby Champion, Ormskirk Champion

Week 44 commencing 29 October: Formby Champion, Ormskirk Champion

5.1.2 Direct Stakeholder Notification

Notification of each of the public information events, in the form of leaflets or letters, were sent directly to:

- Local residents and businesses within 1.5km of the proposed Site (approximately 66 households and 5 businesses)
- The local Member of Parliament (West Lancashire)
- County and Borough Councillors in whose division or ward the Site is located (West Lancashire South division, and Aughton and Downholland ward)
- Parish Councils adjoining the Site (Great Altcar and Downholland)

Analysis of the feedback responses from the first public information event indicate that of the respondents 30% (14 respondents of 47) had heard about the proposal from the direct mailed leaflet. As the leaflet was mailed

only to those residents and businesses within 1.5km of the Site this gives an indication that the direct mailing was a successful method of notifying local residents.

5.1.3 Other

The feedback responses from the first public information event indicate that the respondents had heard about the proposal via the following routes:

Direct mailed leaflet (local residents within 1.5km of the site): 30% (14 respondents)

Newspaper Advertisement: 38% (18 respondents)

Word of mouth: 47% (22 respondents)

Local Council: 28% (13 respondents)

Social Media: 28% (13 respondents)

Other (including local opposition groups): 11% (5 respondents)

It should be noted that, in most instances, respondents indicated more than one of the above routes.

5.2 Attendance

166 people attended the first public information event on 17th February 2018 with 91 attending the second event on 2nd November 2018. On the feedback forms received following the first event, 37 of the 47 respondents (79%) identified as local residents whilst 6 respondents (13%) identified as working in the local area. Three attendees identified themselves as local councillors and one as a member of a special interest group (unspecified).

At the second event, 19 of the 22 respondents (86%) identified as local residents whilst 2 respondents (9%) identified as working in the local area. Two attendees identified themselves as local councillors and two as members of a special interest group (unspecified).

In addition, the local MPs for West Lancashire and Sefton Central attended the second event.

5.3 Public Information Event Format

Each of the public information events was held in Haskayne Village Hall, the nearest suitable venue to the Site. The venue is wheelchair accessible. The events were scheduled at times to ensure that as many local stakeholders would have the opportunity to attend. The strong attendance indicates that this objective was achieved.

At each event a series of information boards (attached as Appendices A & B) were provided.

At the first event, the information focussed on introducing the Applicant, outlining the proposed development, the history of oil and gas exploration in NW England, the regulatory environment for onshore oil and gas and the wider context around the need for and uses of natural gas in the UK.

At the second event there was an increased focus on highlighting the major findings of the various studies prepared in support of the environmental impact assessment for the proposed development.

At both events, senior member of the Applicant's project team along with representatives of the Applicant's planning consultants were in attendance to answer questions from members of the public.

In addition to asking questions, members of the public provided verbal feedback on the proposals during the events and were encouraged to complete the available feedback forms. Issues raised verbally, via the feedback forms or subsequent to the events via email, the Applicant's website or the telephone information line were collated and are discussed below in Section 5.5.

5.4 Analysis of Feedback Forms

The number of completed feedback forms expressed as a percentage of registered attendees was reasonable constant between the two public information events. 47 feedback forms were completed at the first public information event (representing 28% of attendees) and 22 feedback forms were completed at the second public information event (representing 24% of attendees).

Attendees were asked which of the following aspects of the proposal they were interested in

- Planning and consultation process
- Induced seismicity
- Water
- Environment
- Transport
- Fracturing fluid
- Operations and environmental planning

A large proportion of all respondents across both events indicated that they were interested in all the above aspects.

At the first event, water and the environment were marginally favoured (each with 42 mentions from 47 responses) over Operations and environmental planning (41 mentions) with fracturing fluid (35 mentions) and Induced seismicity (34 mentions) the least referenced but still strongly represented.

A similar picture was seen in the feedback responses at the second event with each of the categories receiving between 13 and 15 mentions from 22 responses.

Respondents also had the opportunity to raise any other issue that they had regarding the proposals. The main areas raised are included below in Section 5.5.

Feedback was also sought on the perceived usefulness of the public exhibition.

At the first public information event 32% of respondents indicated that they had found the public exhibition either Very Useful or Useful, with 66% indicating that they had found the public exhibition either Not Useful or Not Useful at all.

In contrast, at the second public information event 53% of respondents indicated that they had found the public exhibition either Very Useful or Useful, with only 27% indicating that they had found the public exhibition either Not Useful or Not Useful at all.

One possible interpretation of this improvement is that at the second event more detailed information on the expected impact of the proposed development, from the results of the environmental impact assessment, was available and could be shared with attendees.

5.5 Summary of Issues Raised and Our Response

This section summarises the issues raised at the public information events either verbally or via the feedback forms, or subsequently via the dedicated project email or telephone line, or via the Applicant's website.

This section only addresses issues that have a direct relevance to the proposed development and not issues or concerns raised that relate to wider UK energy policy etc.

5.5.1 Public Information Events

Many of the issues or concerns raised at the first public information event were generic concerns applicable to UK onshore oil or gas developments and included:

Issue or Concern	Aurora Response
Lack of confidence that the regulators, in particular, the Environment Agency, were competent or sufficiently resourced to do their job effectively	This is a matter to be raised with other bodies.
Industrialisation of the countryside	The current proposal is for a single exploration site. Any subsequent commercial development would be conducted from a small number of multi-well sites. The exact number and location of future sites is yet to be determined as it requires information that will be obtained from the currently proposed wells.
Impact on climate change	The environmental statement will address the greenhouse gas impact of the proposed development.
What will the fracturing fluid contain?	The fracturing fluid will be predominantly water and sand with minor additives such as a friction reducer. The details of the proposed fluid will be included in a permit to be approved by the Environment Agency.
How and where wastes, in particular flowback fluids, will be disposed of?	The safe disposal of all industrial wastes will be controlled by permit by the Environment Agency. A number of appropriately licensed facilities in northern England are available to take flowback fluid from the proposed development.
Potential for contamination of shallow aquifers	In the context of a similar development for which environmental permits have been issued, the Environment Agency have agreed with the applicant that there is no plausible pathway for retained fluids to migrate upwards into contact with shallow groundwaters.
Is shale gas exploration safe?	Yes, the UK has a long history of and a globally recognised reputation in the regulation of oil and gas operations both onshore and offshore.

The following site-specific issues were raised at the first public information event:

Where and in what direction will the horizontal well section be drilled	The exact location and orientation of the horizontal section is yet to be finalised. It will be drilled perpendicular to the maximum stress direction which will be confirmed on drilling the vertical well. The indicative area in which any subsurface activity would take place was included in the display material.
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What information is available regarding local air quality?	Both baseline air quality and the modelled impact on air quality of the proposed development will be addressed in the environmental statement to be submitted along with the planning application.
How will air quality be monitored?	Air quality will be monitored throughout the project in accordance with an agreed air quality monitoring plan.
Will baseline environmental data e.g. water data and water and analyses made during operation be made available?	Information submitted as part of any relevant environmental permit application and the detail of any permit granted will be in the public domain. The results of ongoing environmental monitoring during operations and any relevant baseline data will be made available via an online portal.
Will the results of the 3D geophysical survey be made available?	Under the PEDL licence the seismic data will remain confidential until 1 January 2021 after which time, the data will be available for purchase from the relevant data release agent.
What environmental assessment has been made on wildlife?	Habitat and species-specific studies have been undertaken or have been commissioned, the results of which will be included in the environmental statement to be submitted along with the planning application.
What impact will the development have on migratory birds?	The impact of the development on birds including migratory birds will be addressed in the environmental statement to be submitted along with the planning application.
What will be the impact on the irrigation of agricultural crops?	There will be no impact of the proposed development on the irrigation of crops.
What will be the visual impact on those living close to the site?	A landscape and visual impact assessment which will include a series of photomontages illustrating the proposed development will be included in the environmental statement to be submitted along with the planning application.
Has the presence of existing contaminants in the area been recorded?	A contaminated land assessment will be included in the environmental statement to be submitted along with the planning application.
What would happen if the wells were to leak?	The well design will be assessed by an independent well examiner and reviewed by the Health and Safety Executive. Multiple barriers are in place to minimise the risk of a leak to the environment. The Site will be designed with an impermeable membrane and bunds to contain any on-site spillage.
What level of insurance will be in place to cover the risk of environmental damage and for how long?	The Petroleum Exploration and Development Licence (PEDL) requires the operator to maintain appropriate levels of insurance throughout the term of the licence. In addition, any environmental permit will remain in place until such time that the Environment Agency is satisfied that there is no residual risk to the environment

Has research been conducted on the effect of long duration, low level underground vibration?	The proposed development is not expected to give rise to long duration low level vibrations that would be felt beyond the immediate vicinity of the drilling rig. Hydraulic fracture stimulation during normal operations will not result in vibration at the surface. A traffic light monitoring system aimed at mitigating the impact of any induced seismic events, will be implemented at Altcar Moss and peak particle velocity (PPV) monitoring will ensure that any ground vibration is below a level that could cause cosmetic damage to even the most vulnerable structures.
Concern that local properties have no foundations and will be susceptible to vibration from operations and earthquakes.	The proposed operations are not expected to generate surface vibrations of a magnitude that could result in cosmetic damage to even the most vulnerable structures.
Will the disposal of waste be subcontracted and to whom?	Wastes from the site will be removed to appropriately licensed waste facilities, where appropriate by licensed contractors. No contracts for the disposal of waste are currently in place.
What will the waste disposal process be?	This is a matter for the waste contractor.
Will the proposed traffic access route be able to cope with the additional traffic?	A Traffic Impact Assessment will be included in the environmental statement to be submitted along with the planning application.
A concern was raised as to traffic passing residential properties on Broad Lane	Broad Lane will be assessed as a potential second access route to the proposed site. No decision has been made at this stage if this second route will be progressed.
Where will the water for the hydraulic fracture stimulation be sourced from?	Water will be sourced from the local utility company supply as for any other industrial user. This will not result in any adverse impact on the availability of water to the public.
Will the project negatively impact local house prices or cause insurance costs to rise and will the Applicant compensate resident for any loss?	There is no evidence that property prices or the cost of insurance will be negatively impacted by shale gas developments
The proposed site will flood if the Environment Agency turn off the pumps.	Whilst there have been discussions over a long period as to who should be responsible for ongoing funding of the local drainage pumps it is not expected that the pumps will be turned off as they are vital for agriculture in the area. A flood risk assessment will form part of the environmental statement to be submitted along with the planning application.

Subsequent to the event, a number of generic questions were raised by the local Champion newspaper using material supplied by one of the local opposition groups. The questions and Aurora's responses, as published in this newspaper, are given below:

Why does the industry over-state the amount of gas that can be recovered by using figures for "gas in place" rather than that which could possibly be recoverable, which is a fraction of GIP?	Estimates of gas-in-place are routinely used as this is the quantity of gas physically in the rock. The amount of gas that is ultimately recoverable is dependent upon the technology applied and generally increases over time as technology advances. In the case of UK shale,
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	estimates of recoverable gas will only be possible once the results of initial production tests are available.
Why does the industry claim that "fracking has been done safely in the UK for 60 years without problems"? Only one well has been the subject of high-volume high-pressure hydraulic fracturing and that was at Preese Hall in 2011, which caused the Blackpool earth tremors and wrecked the well. That is a 100% failure rate?	Thousands of wells are hydraulically fractured around the world every year. The technique is commonly applied offshore in the UK and much of UK gas production comes from wells that have undergone hydraulic fracturing.
Isn't "Gold standard regulation" a meaningless expression? Isn't it, in fact, true that it is the company that is responsible for safe operation irrespective of any regulatory regime?	Whilst the company is responsible for safe operations the existence of a robust goalsetting, rather than prescriptive, regulatory regime is a key factor in the UK having a globally recognised reputation in the regulation of oil & gas operations.
We hear repeatedly from the industry that "only non-toxic materials are used in fracking". Isn't it true to say that any health risks arise more from what comes back up than what goes down? Therefore, isn't that a diversion from the real problem which is the sheer volume of hazardous waste as confirmed in the Institute of Directors' Report funded by Cuadrilla using data provided by Cuadrilla?	The safe treatment of all industrial wastes is controlled by permit by the Environment Agency. They, in common with the other regulatory bodies are satisfied that a shale gas industry in the UK can be developed safely without harm to the environment.

Whilst many of the issue raised at the second public information event were the same as those raised previously the availability of the initial results from the various studies conducted in support of the environmental statement enabled the project team to provide more detailed answers to questions raised.

Additional site-specific issues raised at the second public information event included:

Concern over traffic congestion and the effect on rural B-Roads	The transport and traffic assessment has found that the impact of the proposed development on severance (social impact on community), driver delay, pedestrian/cyclist delay and road safety would be not significant.
Concern that HGVs would not be able to negotiate the junction between the A565 and the B5195 and the roundabout by Tesco	The access route has been assessed as part of the traffic and transport assessment and found to be suitable. Both the junction and the roundabout are used routinely by HGVs.
Concerns about earthquakes resulting from operations	The risk and impact of induced seismicity resulting from the proposed development has been assessed as part of the environmental impact assessment. Induced seismicity from the proposed development is very unlikely to result in vibrations at the surface at a level to cause cosmetic damage to even the most sensitive structures.

Concerns as to the effects on local residents/private property	The findings of the studies conducted in support of the environmental impact assessment indicate that there will be no significant adverse effects on local residents or private property resulting from the proposed development
Lack of public consultation about whether such developments should go ahead	The development of domestic oil and gas resources has been the policy of successive governments of all persuasions since the nationalisation of Petroleum by Ramsay MacDonald's National Government in 1934. Licences are only awarded following an appropriate Strategic Environmental Assessment.

5.5.2 Project Email Address

The Applicant has maintained a project specific email address (info@altcarmoss.co.uk) since 4th January 2018. The email address was included in the letters sent to local stakeholders on announcement of the project, in the leaflets and the newspaper advertisements advertising the public information events and was prominently displayed on each of the display boards at these events.

Up until 28th May 2019 a total of 13 messages had been received. 7 of the messages received related to the Altcar Moss wellsite and comprised requests to be kept informed about the project, requests for copies of the material used at the public information events or were seeking clarification of information obtained from these events. 3 further messages were media enquiries. The Applicant responded to all relevant enquiries.

5.5.3 Project Telephone Line

The Applicant has maintained a project specific Freephone telephone line (0800 170 1550) since 4th January 2018. The Freephone telephone number was included in the letters sent to local stakeholders on announcement of the project, in the leaflets and the newspaper advertisements advertising the public information events and was prominently displayed on each of the display boards at these events.

Up until 28th May 2019 a total of 5 calls had been received comprising 3 enquiries as to the time and location of the public information events and 2 requests for an update on the proposals.

5.5.4 Website Contact Form

The Applicant's website has a 'Contact Us' form through which interested parties may contact the company. 78 messages were received between the date that the project was announced (4th January 2018) and 28th May 2019. 37 of the messages (47%) related to the offer of services to the company, 22 (28%) were employment enquiries, 10 (13%) were media enquiries and 2 (3%) were enquiries relating to other licences held by the Applicant. The remaining 7 messages (9%) were from members of the public and regarding activity on the PEDL 164 licence. They comprised 1 enquiry regarding property conveyancing (1.5%), 5 neutral enquiries (6%) and 1 enquiry (1.5%) expressing opposition to shale gas developments.

5.5.5 Changes to the Proposed Development

None of the issues raised at, or as a result of, either of the two public information events have resulted directly in any changes to the proposed development. However, following assessment it was decided not to progress the second access route along Broad Lane which has the indirect effect of addressing one of the site-specific concerns raised at the first public information event.

The development, as proposed, already incorporates a range of embedded or additional mitigations aimed at ensuring that the adverse impact of all aspects of the development will be negligible and that the proposal is, in the view of the Applicant, acceptable in planning terms.

6. ONGOING CONSULTATION AND COMMUNICATION

It is proposed that if planning consent is received for the Altcar Moss Site, a Community Liaison Group will be established, its members to be selected from local residents living within 1.5km of the Site, and local politicians whose ward contains or adjoins the proposed site along with representatives from the Applicant. The aim of the Community Liaison Group is to provide a forum for dialogue between the Applicant and the local community during the life of the project.

It is further proposed that a project newsletter will be produced to keep local residents informed about the project. The local parish councils will be kept up to date with the project and all local stakeholders will be informed in advance of any major project milestones e.g. commencement of site construction.

In addition to the above, a project website, telephone information and email contact point will be maintained through the life of the project.

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7. CONCLUSION

The Applicant recognises the importance of pre-application engagement with the local community. This Statement of Community Involvement has reviewed the results of the engagement efforts made ahead of the submission of the planning application for the Altcar Moss wellsite.

The focus of the pre-application public engagement has been to provide relevant information on the proposed development both at public information events and via the Applicant's website and to provide local stakeholders with an opportunity to ask questions about and comment on the proposed development.

The Applicant has assessed all the feedback received to identify any changes that might be made to the proposed development ahead of submission.

Should the application be granted, the Applicant is committed to extending the public engagement effort by the formation of a Community Liaison Group that would be active throughout the life of the project.

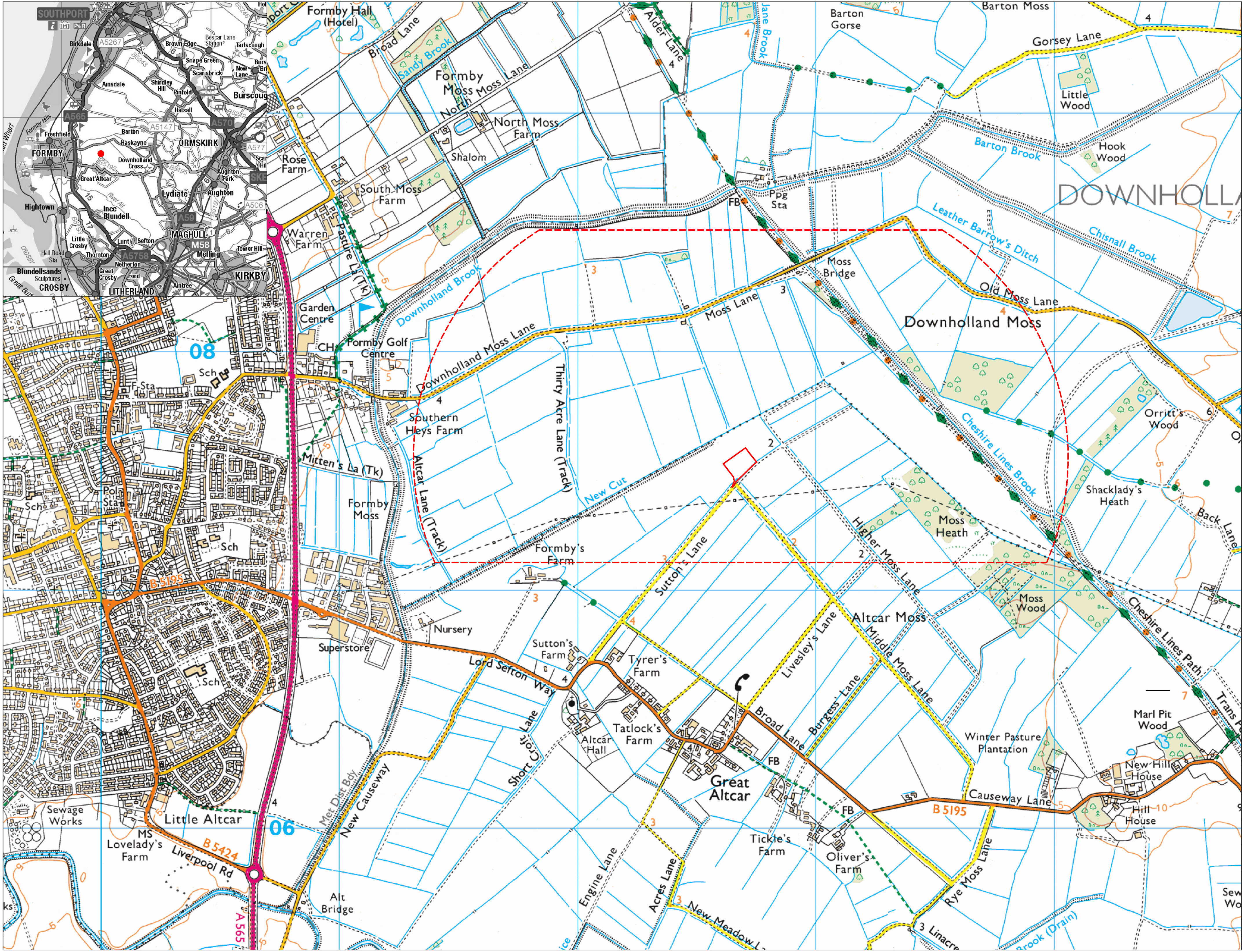
APPENDIX A – DISPLAY BOARDS FIRST PUBLIC INFORMATION EVENT

WELCOME TO OUR INFORMATION EVENT

Thank you for visiting today. This is an initial opportunity for you to find out about our plans for the proposed Altcar Moss site . Members of the project team are on hand and will be happy to answer any questions.

As the relevant Mineral Planning Authority, Lancashire County Council will consider any future planning application for exploration activity at Altcar Moss.

Aurora has recently submitted a Scoping Request to the Council which represents the first step in agreeing the nature and scope of any environmental assessments required to support the proposed activity.



Location of Altcar Moss site showing possible extent of subsurface works (dashed)

YOUR VIEWS

Once you have had an opportunity to look at our proposals and to talk with members of the team, please fill in one of our feedback forms. If you would prefer, these can be taken away and sent to us later at the email address below.

Your views on the proposals are important to us and appreciated. We will review all comments received and will consider them as we prepare the planning application.

Aurora will hold a second public information event later in the year, ahead of submitting the planning application, where we will present the results of the various studies conducted and the details of the proposed development. There will be an opportunity for members of the public to provide feedback at this event, prior to the application being finalised.

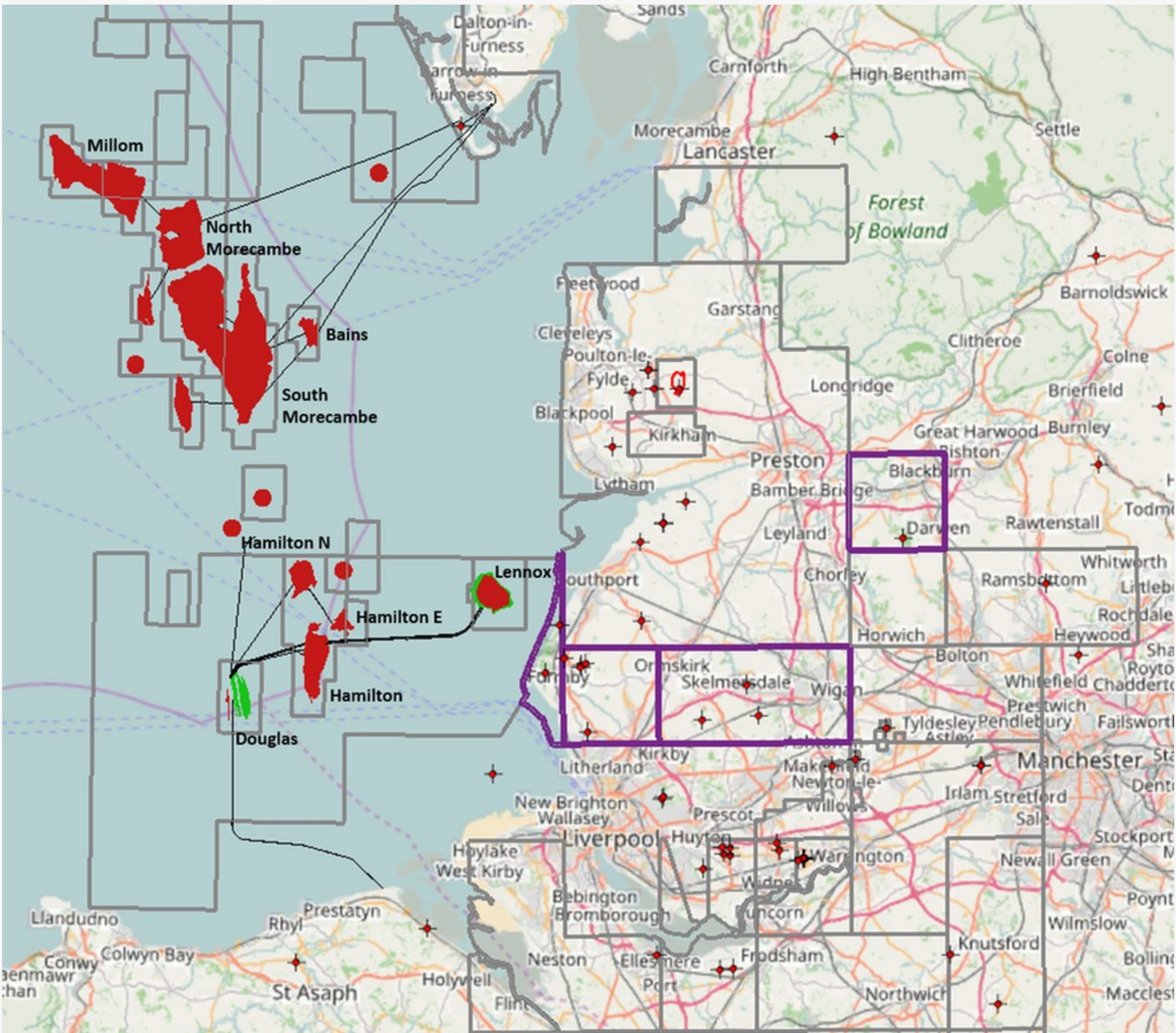
There will be a further opportunity to comment on the proposals during the Council's public consultation process, after the application has been submitted.



OIL AND GAS IN THE NORTH WEST

The North West has a long history of oil and gas exploration and production, stretching back almost 80 years to the discovery of the Formby oilfield.

The discovery of shale gas provides an opportunity to open a new chapter in the hydrocarbon story of the region.



Map showing the location of Petroleum licences, onshore wells and offshore fields in NW England (AER licences shown in purple)

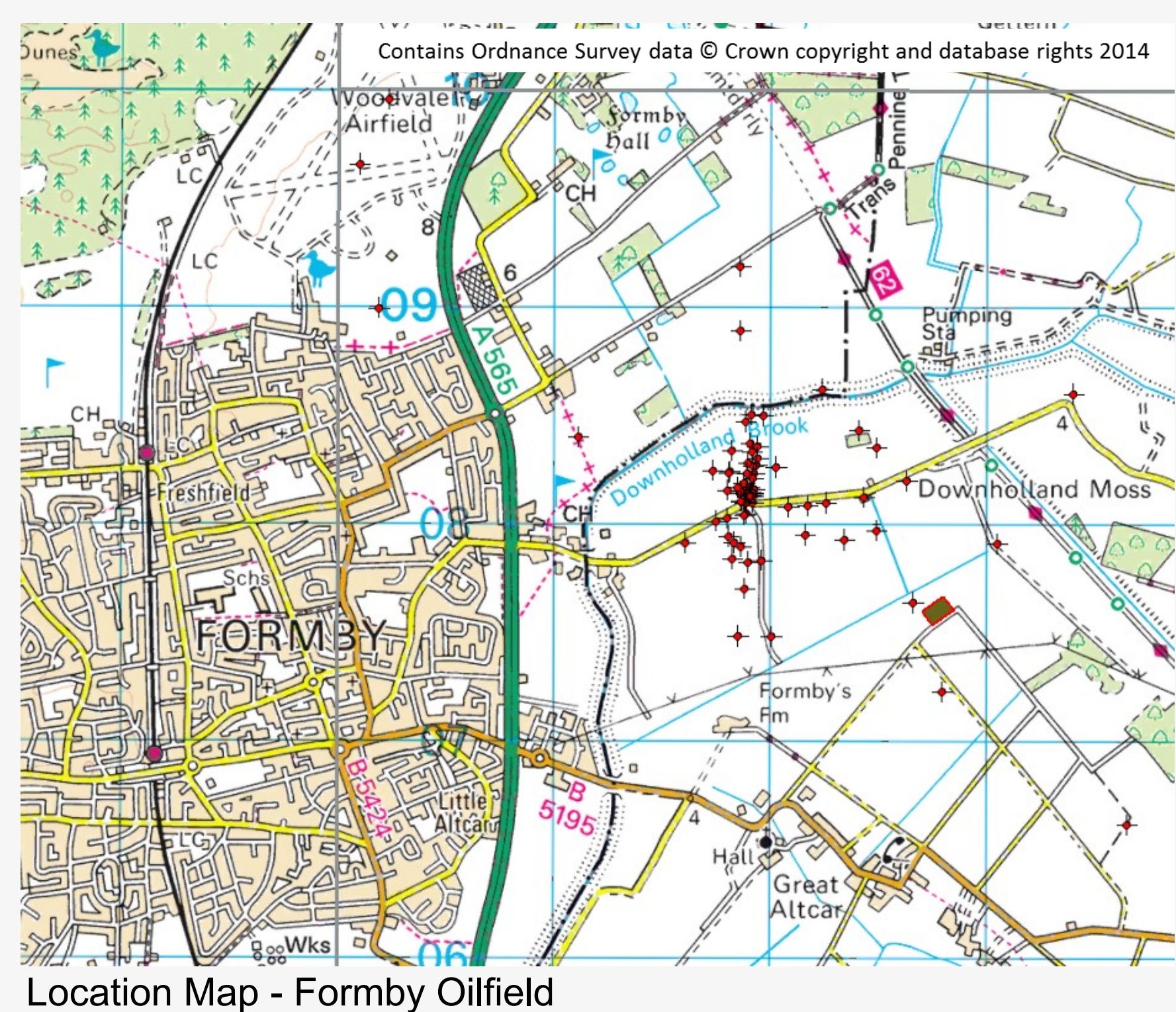
TIMELINE OF OIL & GAS ACTIVITY IN THE NORTH WEST

1637:	Formby oil seeps recorded in Camden's Britannia.
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FORMBY OILFIELD

When people think of oil & gas in the UK, they generally picture oil rigs and platforms in the harsh environments of the North Sea. However, one of the first commercial oil discoveries in the country was made onshore on Downholland Moss, near Formby, shortly before the Second World War.



Natural Oil Seep - Formby Oilfield

The Formby Oilfield was discovered by D'Arcy Exploration Company (a forerunner of BP) in 1939. The field is unusual in that the producing layers are very shallow, being between only 12m and 85m below the surface. In fact the oilfield was discovered as a result of surface seepage of oil from the shallow reservoirs, which can still be seen today.

The oil reservoirs are sandstones of mostly Triassic age (~240 Million years) sealed in part by very much younger glacial boulder clays from the last Ice Age.

Over 90 shallow wells were drilled in the area between 1939 and 1965, when the oilfield was finally abandoned. Many local people remember the last nodding donkey on the field close to the road on Downholland Moss Lane.

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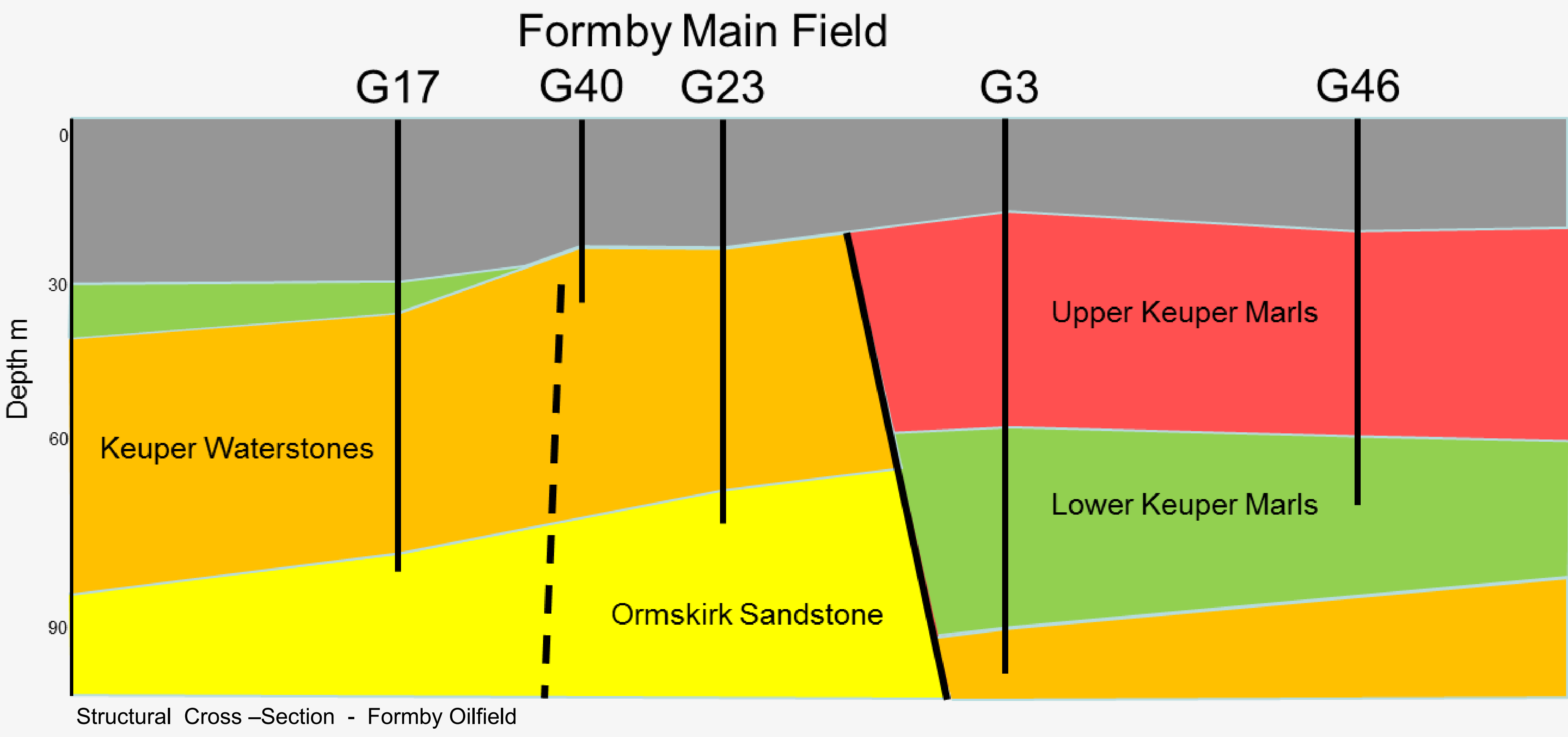
Both wells were securely abandoned and the sites restored to agricultural use.



Oil-soaked Core Sample - Ormskirk Sandstone, Formby Oilfield

“As to the oily matter abovementioned, a Chymist in the neighbourhood extracted from it an Oyl extraordinary Sovereign in Paralytick Distempers.”

Description of the oil recovered from Formby oil seeps in Camdens's Britannia, 1637

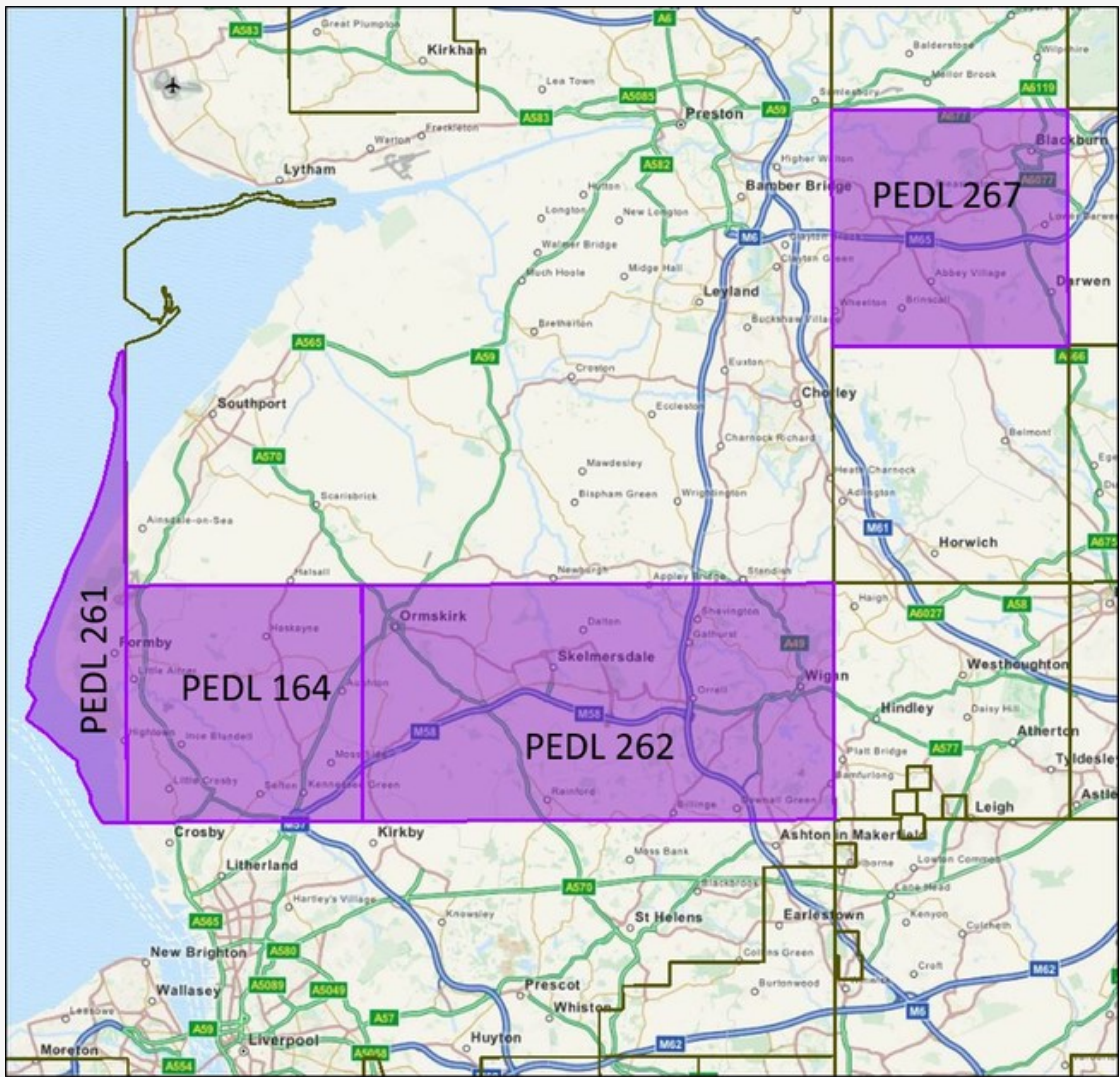


Aurora Energy Resources

ABOUT AURORA

Aurora Energy Resources management team are experienced energy professionals who have had involvement in upstream oil & gas projects, both onshore and offshore, throughout the world over many years.

Based in Aberdeen, Europe's energy capital, the company has access to world class resources to enable it to deliver projects both safely and successfully.



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higher rates of tax than other businesses to reflect the state's ownership of the oil & gas resources.

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Aurora Energy Resources

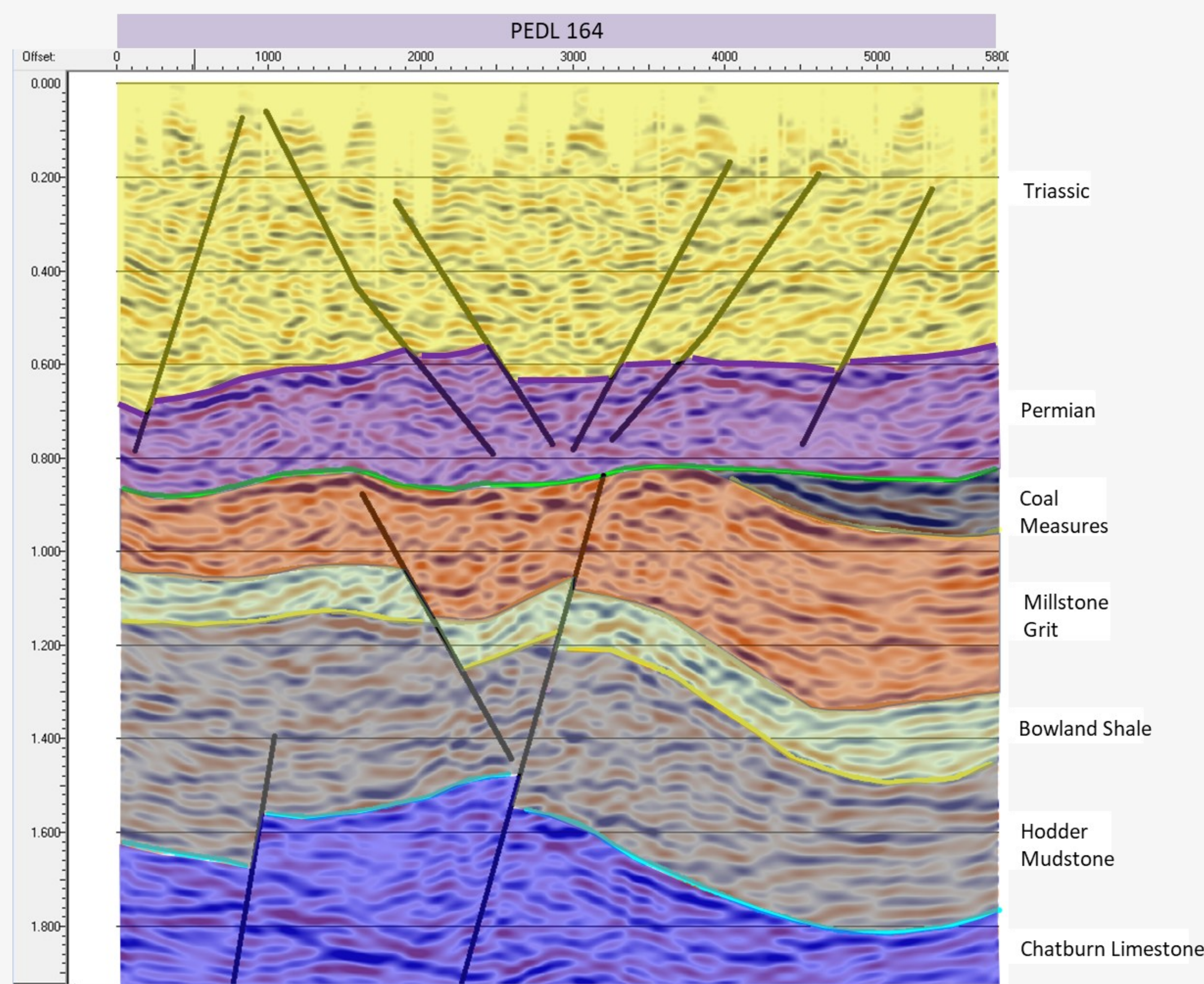
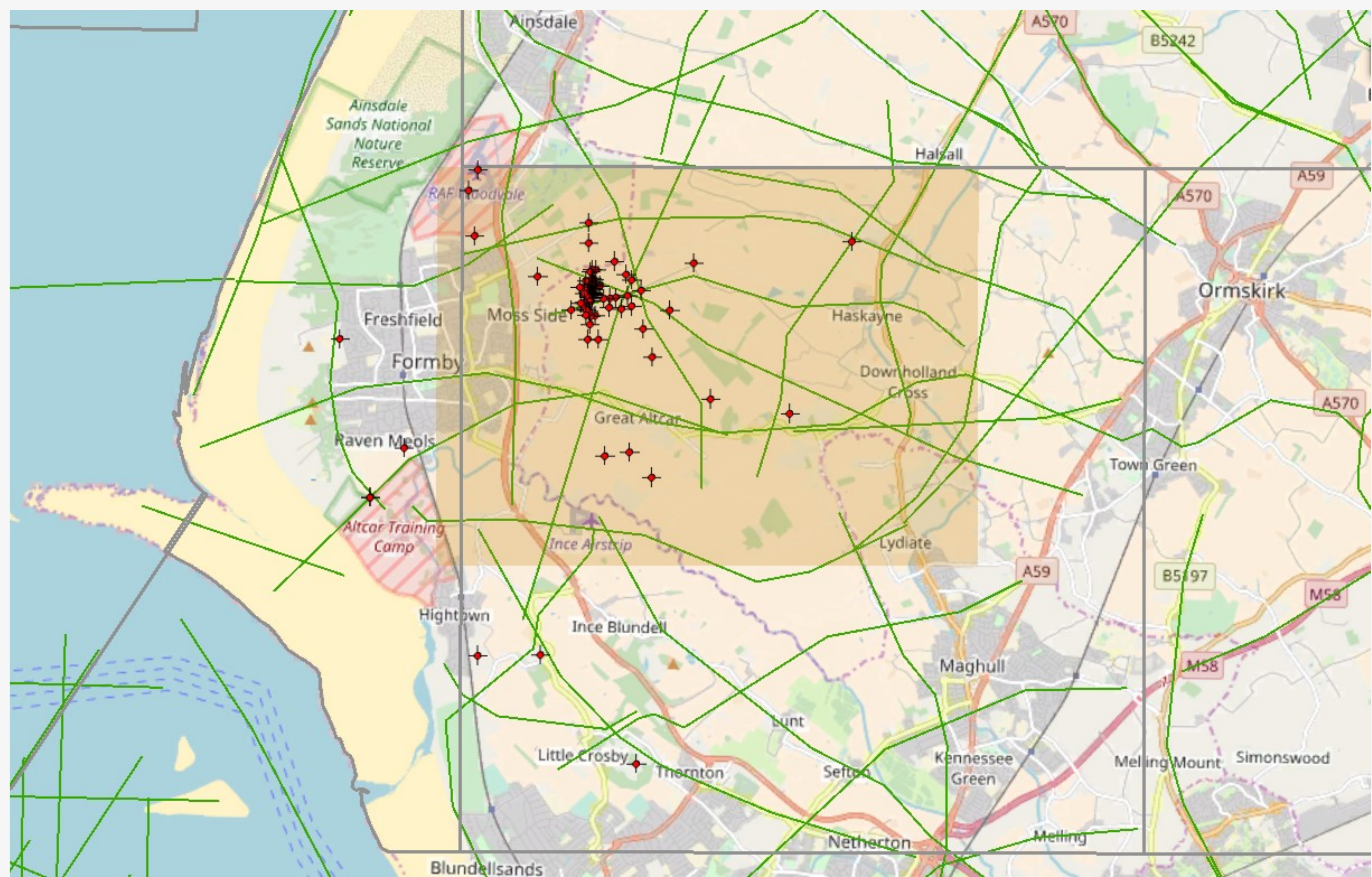
GEOPHYSICAL SURVEY

Aurora Energy Resources acquired a 3D geophysical survey in the PEDL164 licence area in Summer 2016. The purpose of the survey was to use the latest imaging technology to obtain the best possible picture of the subsurface to enhance our exploration efforts.

Acquisition of the survey involved the laying out of an array of almost 2,500 wireless geophones (recording devices) across the survey area and

the recording of reflected signals generated from an array of seismic sources. The sources were generated by small buried charges (1,290 source points) or by specialised tractor-like vehicles fitted with vibrating plates (255 source points).

Similar surveys are routinely acquired throughout the UK with over 75,000 km of 2D data and over 2,000 km² of 3D data having been acquired in the UK since the 1960s.



The results of the geophysical surveys are used by Aurora, along with the results from any wells, and from surface mapping in the area, to understand the structure of the subsurface and to map geological faults and the thickness of the various rock units.

The maps produced are used to define the targets for both vertical and horizontal wells.

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THE ALT CAR MOSS SITE

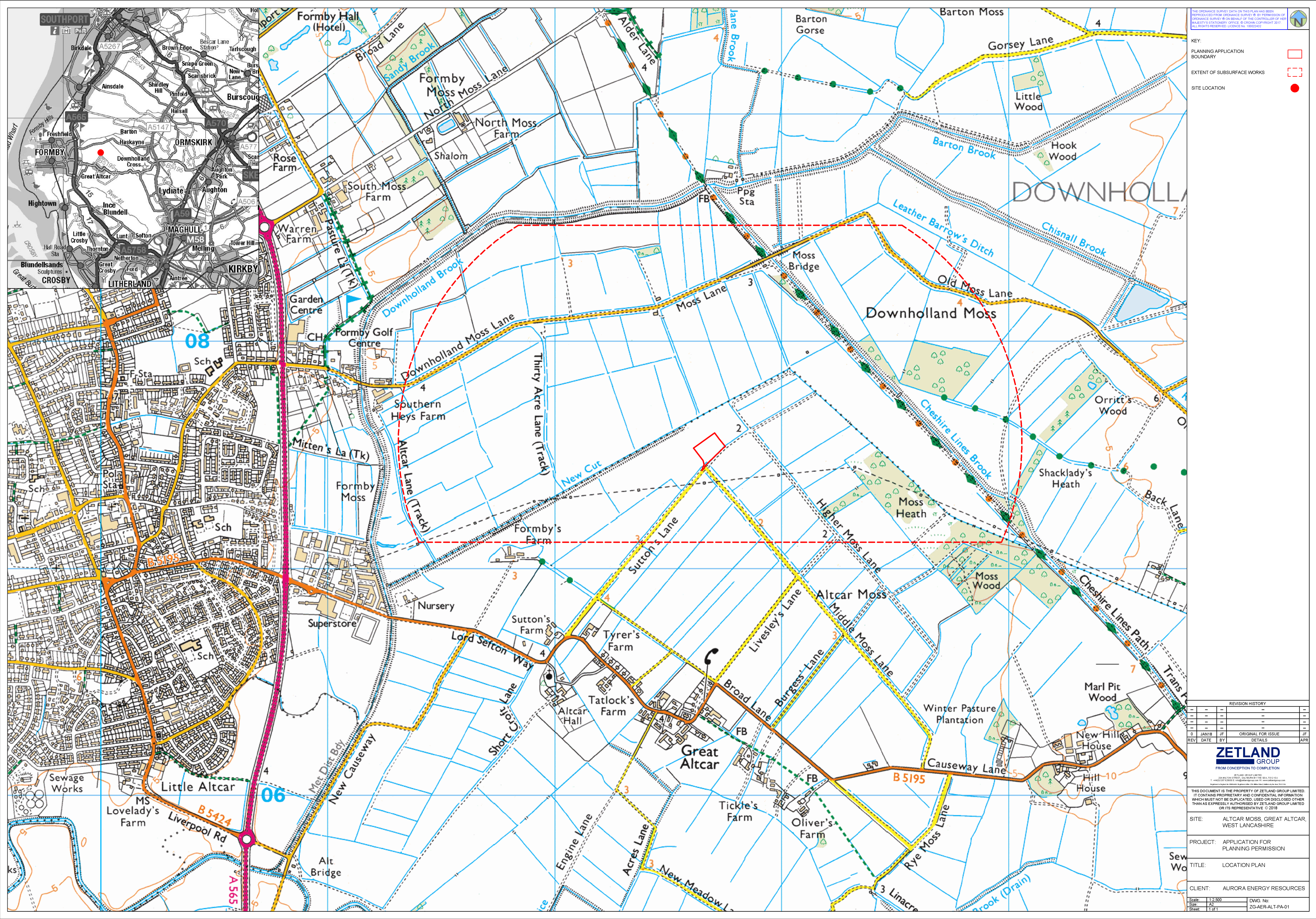
The proposed Altcar Moss wellsite is located in West Lancashire to the north of the village of Great Altcar, within Aurora's PEDL 164 licence.

The site was chosen following an evaluation of the 3D geophysical survey acquired in 2016 and following a review of a number of potentially suitable surface locations in the area.

The proposed site is located ~850m from the closest property, but close to good transport infrastructure.

Aurora proposes to drill and test both a vertical and a separate horizontal borehole at Altcar Moss to evaluate the potential to produce hydrocarbons from deeply-buried, Carboniferous-age rocks.

Both boreholes would undergo hydraulic fracture stimulation to gain important information on the ability of the various shale targets to flow oil and gas.

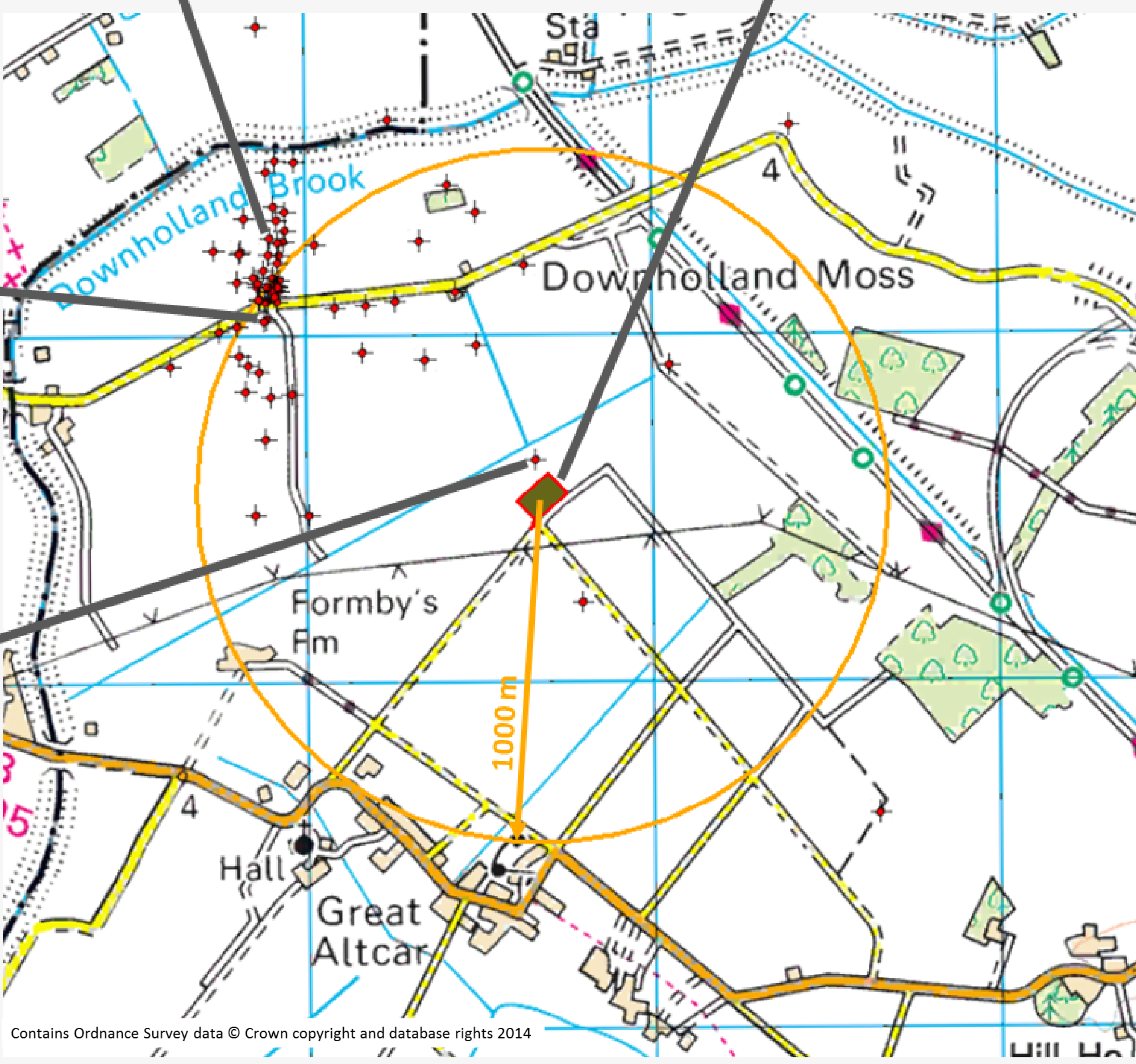


Formby shallow oilfield
1939-1965
Producing depth 130 ft (40 m)

AER Altcar Moss Site

Formby-1
1940-1947
7,680 ft (2,341 m)
Gas in Bowland Shale

Altcar Borehole
1890-1892
1,091 ft (333 m)

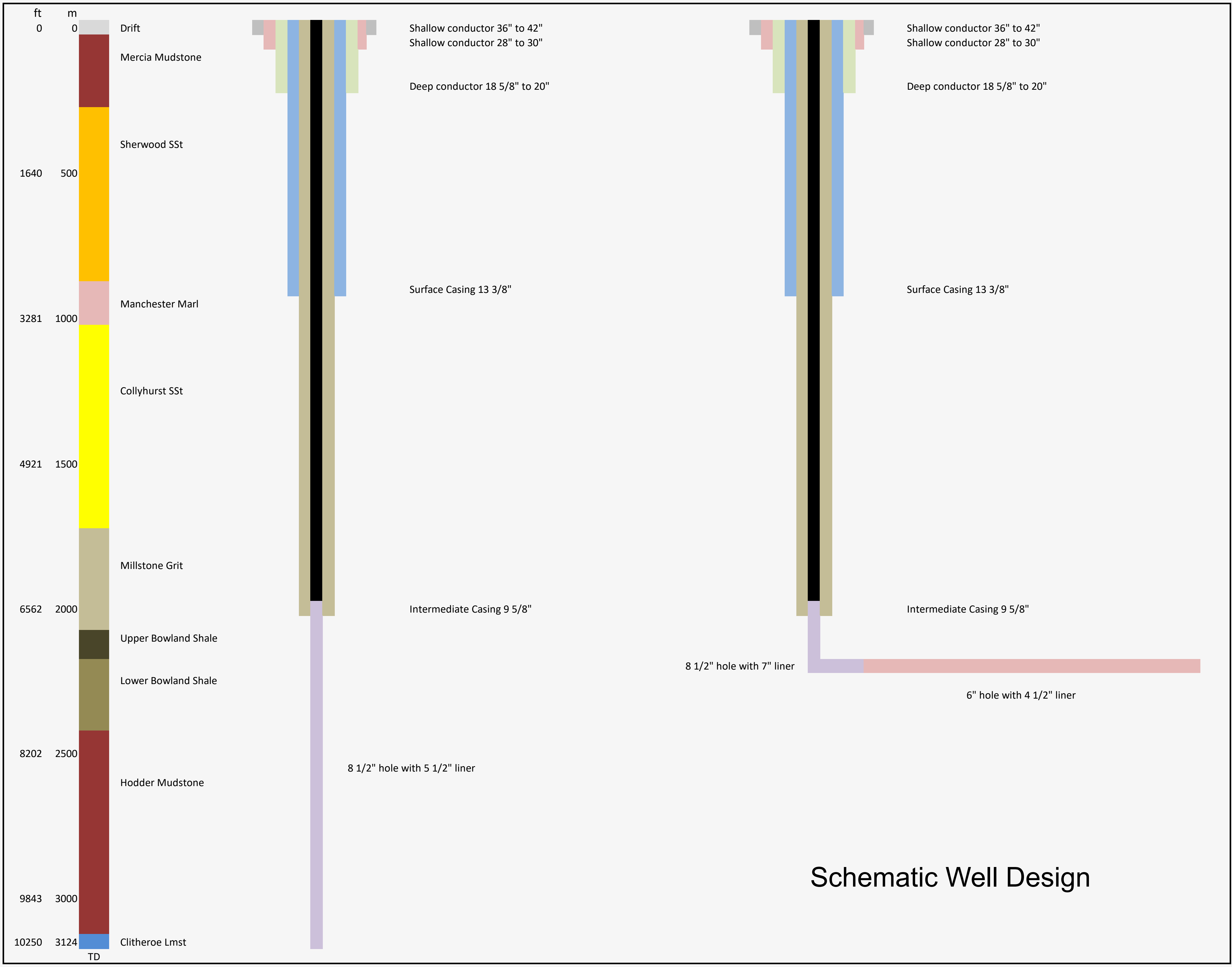


All surface drilling and fracturing operations would take place within a specially constructed well pad underlain by an impermeable membrane designed to protect the local environment.

Following the proposed operations, the site would either be restored to agricultural use or further applications would be made to retain the site for future production operations.



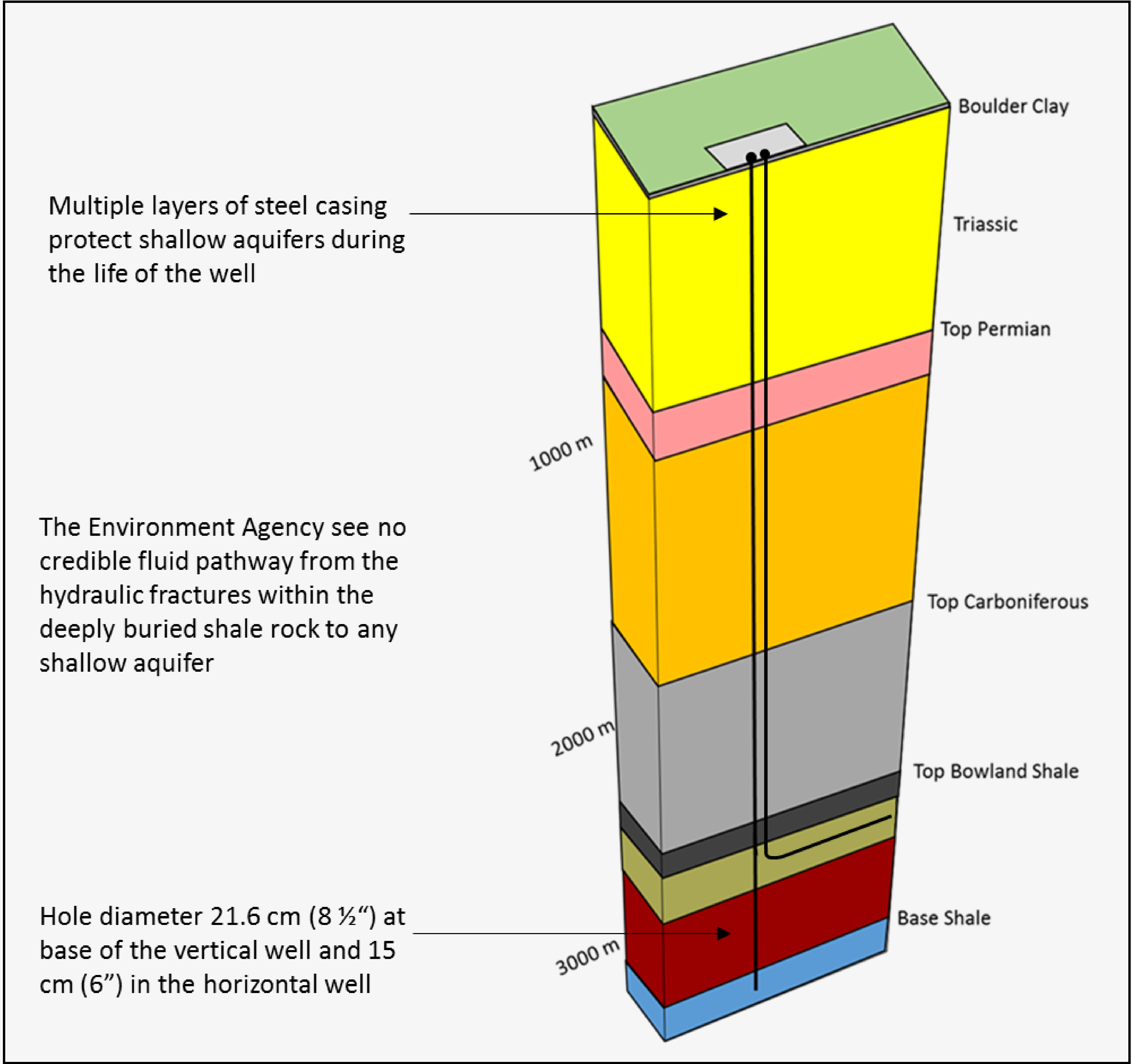
PROPOSED DEVELOPMENT



INDICATIVE DEVELOPMENT SCHEME

- Phase 1 – Wellsite Construction (40 days)
- Phase 2 – Drilling and Coring of a Vertical Borehole (up to 5 months)
- Phase 3 – Drilling of a Horizontal Borehole (up to 5 months)
- Phase 4 – Hydraulic Fracture Stimulation of the Vertical and Horizontal Boreholes (60 days)
- Phase 5 – Initial Flow Testing (60 days)
- Phase 6 – Extended Well Test of the Horizontal Borehole (90 days)
- Phase 7 – Decommissioning and Borehole Abandonment (4 weeks)
- Phase 8 – Wellsite Restoration (30 days)

If the appraisal activities are successful, the site may be retained as a future production site with the drilling of additional production wells, installation of processing equipment and connection to the gas grid. Such development would require further planning & environmental permit consents and approval of a field development plan by the Oil & Gas Authority.



HYDRAULIC FRACTURING

Once the well has been drilled it is time to complete the well for flow testing or later in the project for production.

The hydrocarbons will not flow naturally from, nor can they be pumped out of, the shale rock due to the fact that the shale is naturally too impermeable. Therefore hydraulic fracturing (“fracking”) is used to increase the permeability of the shale rock and allow the hydrocarbons to be produced into the wellbore.

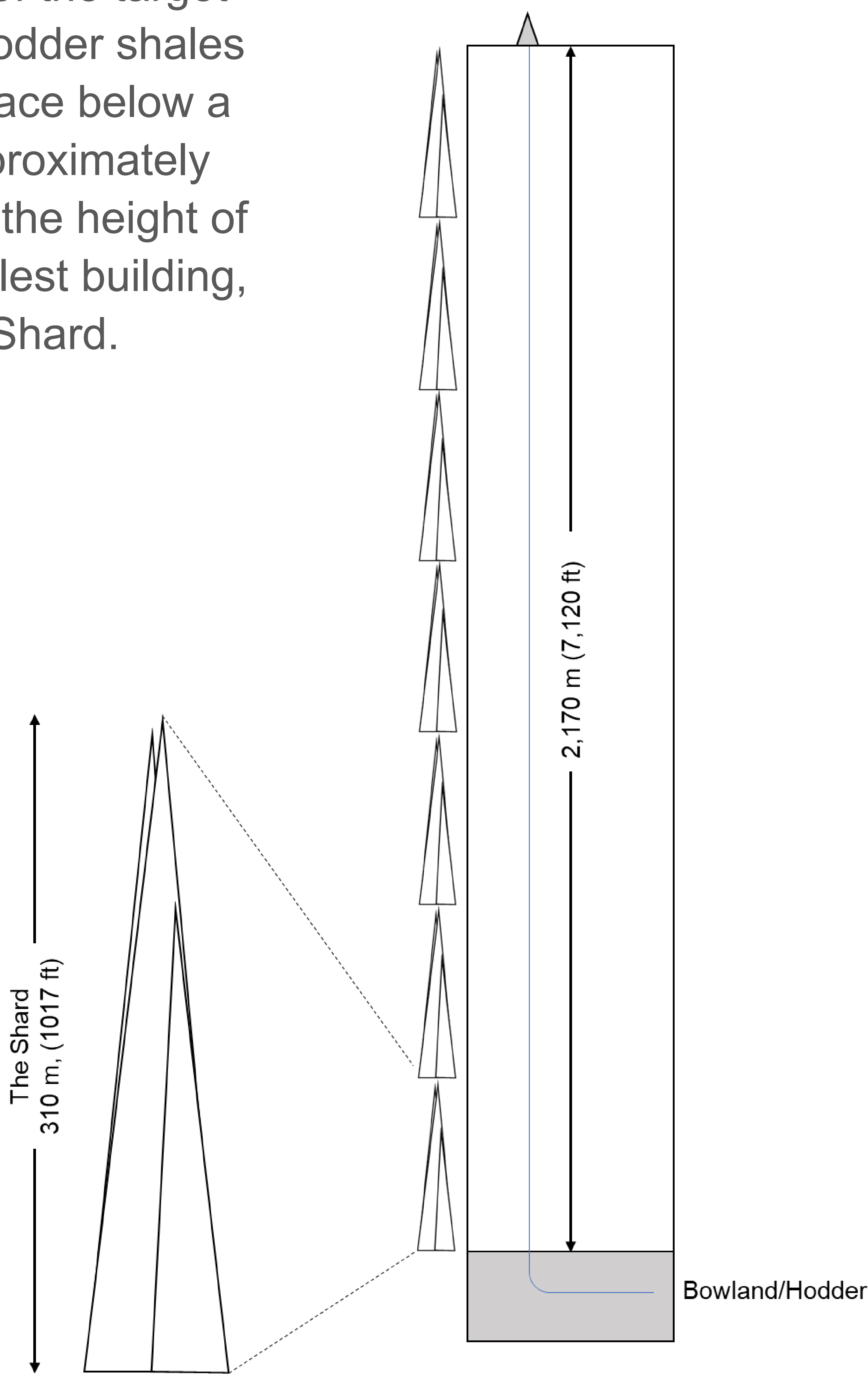
A mixture predominantly comprising water and sand is pumped at high pressure into the well to create a network of narrow fractures. Once the pressure is removed, the fractures

try to close but are held open by the sand grains (called proppant as they prop open the fractures). The gas (and oil) can now flow around the sand grains within the fractures to the wellbore and be recovered.

In a given horizontal well or “lateral” over 30 frac stages may be run during the well completion process with each stage taking typically 2 to 4 hours

Afterwards, the equipment used during the hydraulic fracturing process is removed from the site. The hydraulic fracturing of a well represents a very small percentage of the productive life of the well which may extend over 10 years.

At Altcar Moss, hydraulic fracturing of the target Bowland/Hodder shales will take place below a depth approximately equal to 7x the height of the UK’s tallest building, The Shard.



Given the depth at which the hydraulic fracturing takes place and the maximum height of the fractures produced, there is no risk of the fractures reaching and contaminating shallow water sources.

All components of the hydraulic fracture fluid must be approved in advance by the Environment Agency and the Oil & Gas Authority must approve the proposed Hydraulic Fracture Plan



INDUCED SEISMICITY

Unsurprisingly, there is much public interest around the possibility of hydraulic fracturing causing earthquakes. This follows a series of minor events recorded near Blackpool in 2011 during the hydraulic fracturing of a shale gas exploration well.

The hydraulic fracturing process is designed to split the shale rock and the creation of these micro-fractures can be detected by sensitive specialist equipment. On rare occasions, the fluid injected into the well may lubricate a pre-existing geological fault causing it to slip. This can produce larger seismic events which, if strong enough, may be felt at the surface.

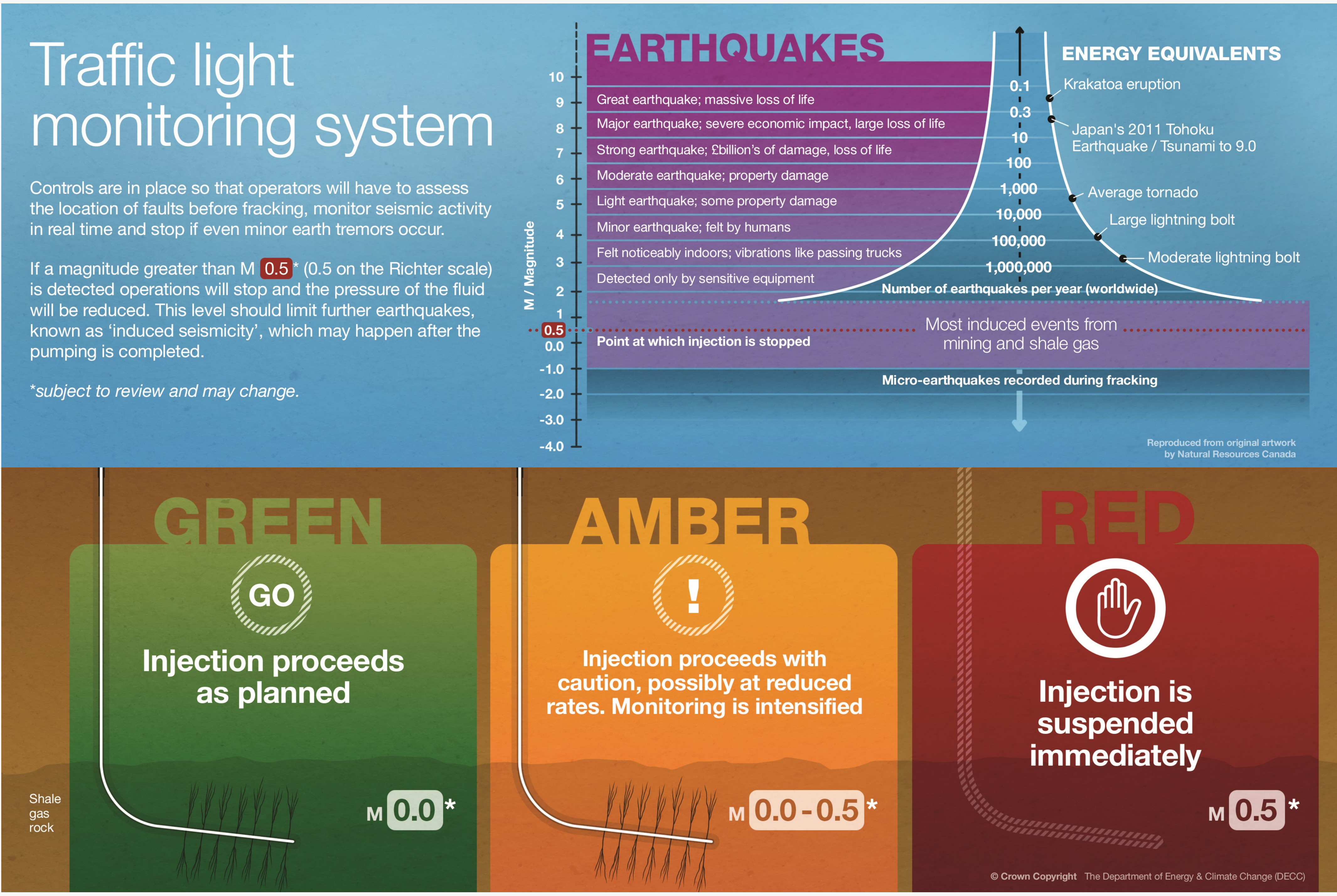
Similar induced seismic events have resulted from some mining operations, extraction of conventional oil and gas, disposal of waste water underground and even the filling of surface reservoirs behind dams for hydroelectric schemes.

The magnitude of seismic event that can be induced is a function of (i) the amount of natural stress built up

within the rock, itself a function of rock strength, and (ii) the area of the fault that slips - which in the case of hydraulic fracturing is related to the amount of the injected fluid that enters the fault.

Studies conducted in the UK for the Government and based upon a long history of coal mining-related induced seismicity have concluded that the largest possible hydraulic fracturing-related earthquake within the Bowland Shale is likely to be of magnitude ML 3.1. On a global scale this is a small event and whilst such an event may be detected at the surface it is very unlikely to result in any damage to property.

To put the above into perspective, the largest recorded natural earthquake onshore in the UK occurred in 1984 on the Llyn Peninsular with a magnitude of ML 5.4. This earthquake released ~45,000 times more energy than the largest of the Blackpool induced shale gas earthquakes (ML 2.3).



A traffic light monitoring system, as illustrated above, aimed at mitigating the impact of any induced seismic events, will be implemented at Altcar Moss. In addition, peak particle velocity (PPV) monitoring will aim to ensure that any ground vibration is below a level that could cause even minor damage to property.

During normal operations, downhole microseismic monitoring will be used to map the growth of hydraulic fractures to ensure these remain within the target zone.



BENEFITS OF DEVELOPMENT

UKOOG Community Benefit Scheme

£100,000 per site plus 1% of production revenues which could total £10 million from a single site.

Shale Wealth Fund

Aimed at ensuring that communities that host developments share in the benefits. 10% of shale gas tax revenues to be invested locally.

Business Rates

100% of business rates to be retained locally.

Jobs

EY estimate the development of a successful UK shale gas industry could generate 64,000 jobs.
The industry could also safeguard 100,000 jobs in the UK petrochemical industry.

Regional Development

The North West is well situated to benefit from the development of a UK shale industry.

Energy Security

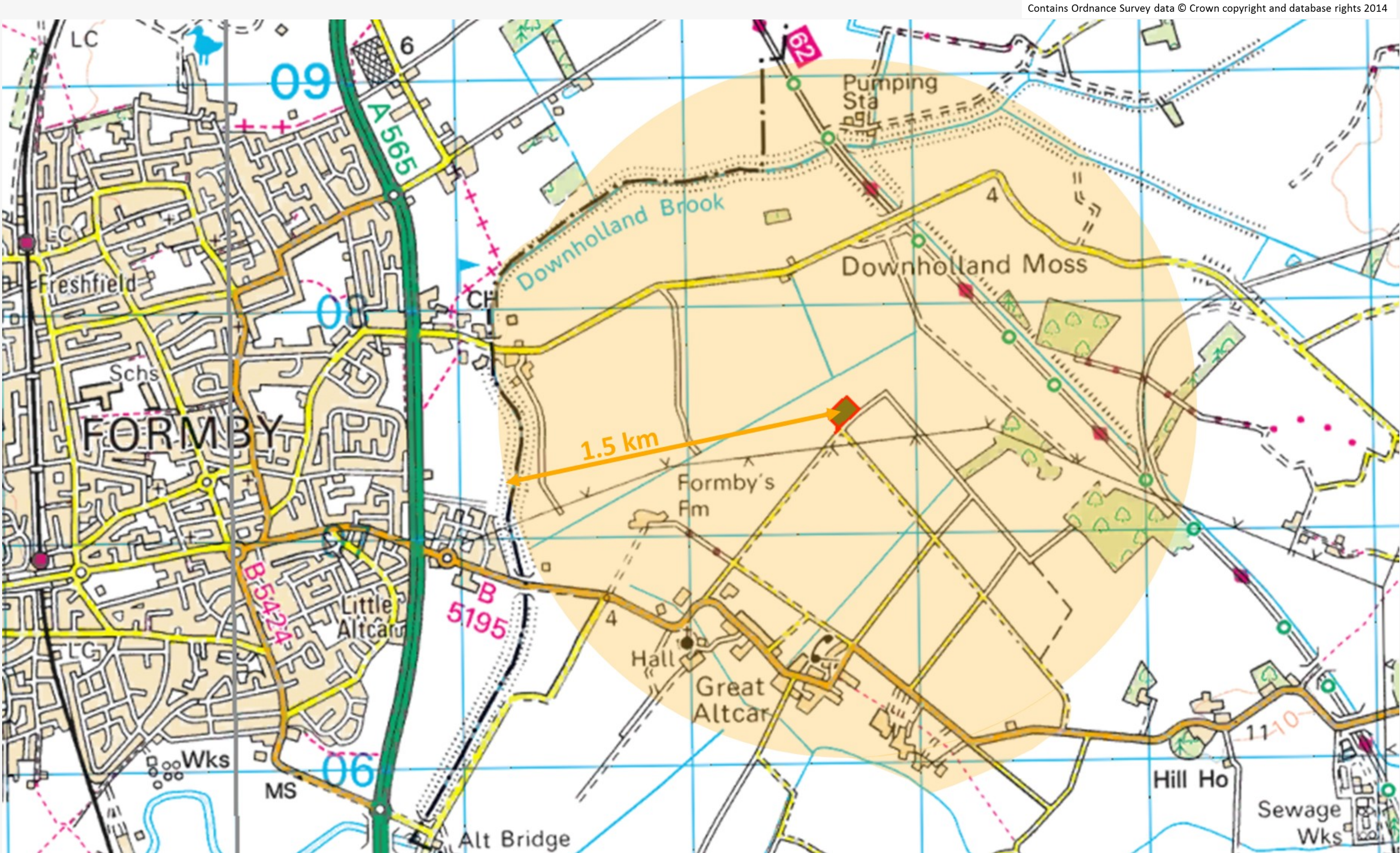
Developing our own resources reduces the UK’s dependence on expensive imports.

Supply Chain Opportunities

Local businesses can grow to service this new industry.

Climate Benefits

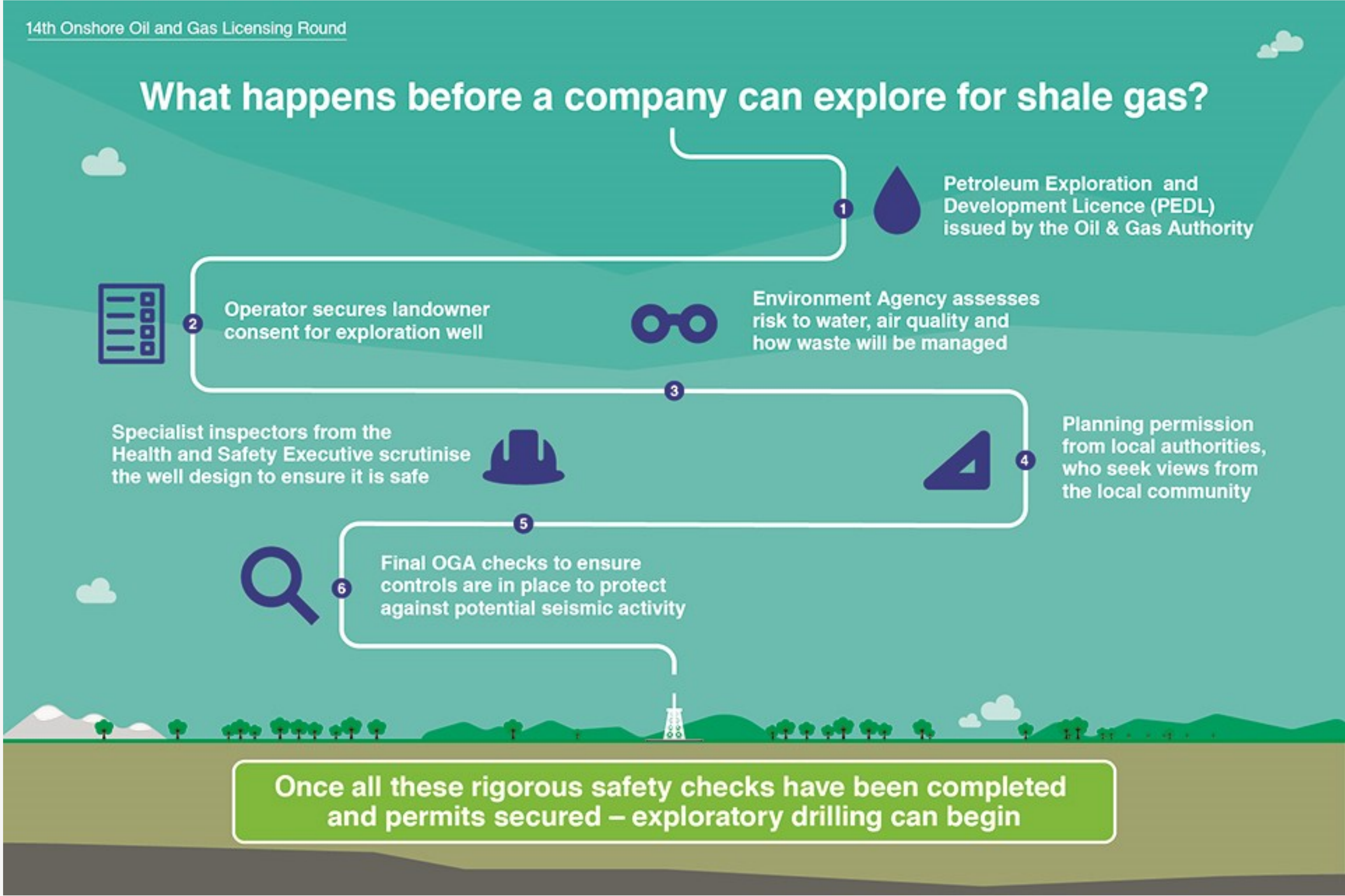
Gas produced at home is expected to have a lower carbon footprint than gas imported either via long-distance pipeline or as liquified natural gas (LNG).



REGULATION OF UK OIL & GAS

The onshore oil & gas industry is regulated by a number of statutory bodies including the Environment Agency, Health and Safety Executive, Mineral Planning Authorities (in the case of the Altcar Moss site, this is Lancashire County Council) and the Oil & Gas Authority (OGA).

The UK has a globally recognised reputation in the regulation of oil and gas activities both onshore and offshore stretching back many decades.



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The Minister retains certain responsibilities under the Infrastructure Act (2015) with regards to Hydraulic Fracturing Consents



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The OGA issues and administers PEDL licenses and reviews and approves plans for drilling, and hydraulic fracturing



Environment
Agency

The EA issues environmental permits covering oil & gas operations and is a statutory consultee in the planning process



The HSE monitors oil and gas operations from a well integrity and site safety perspective



As the relevant Mineral Planning Authority, LCC is responsible for the local planning process and the setting and monitoring of planning conditions

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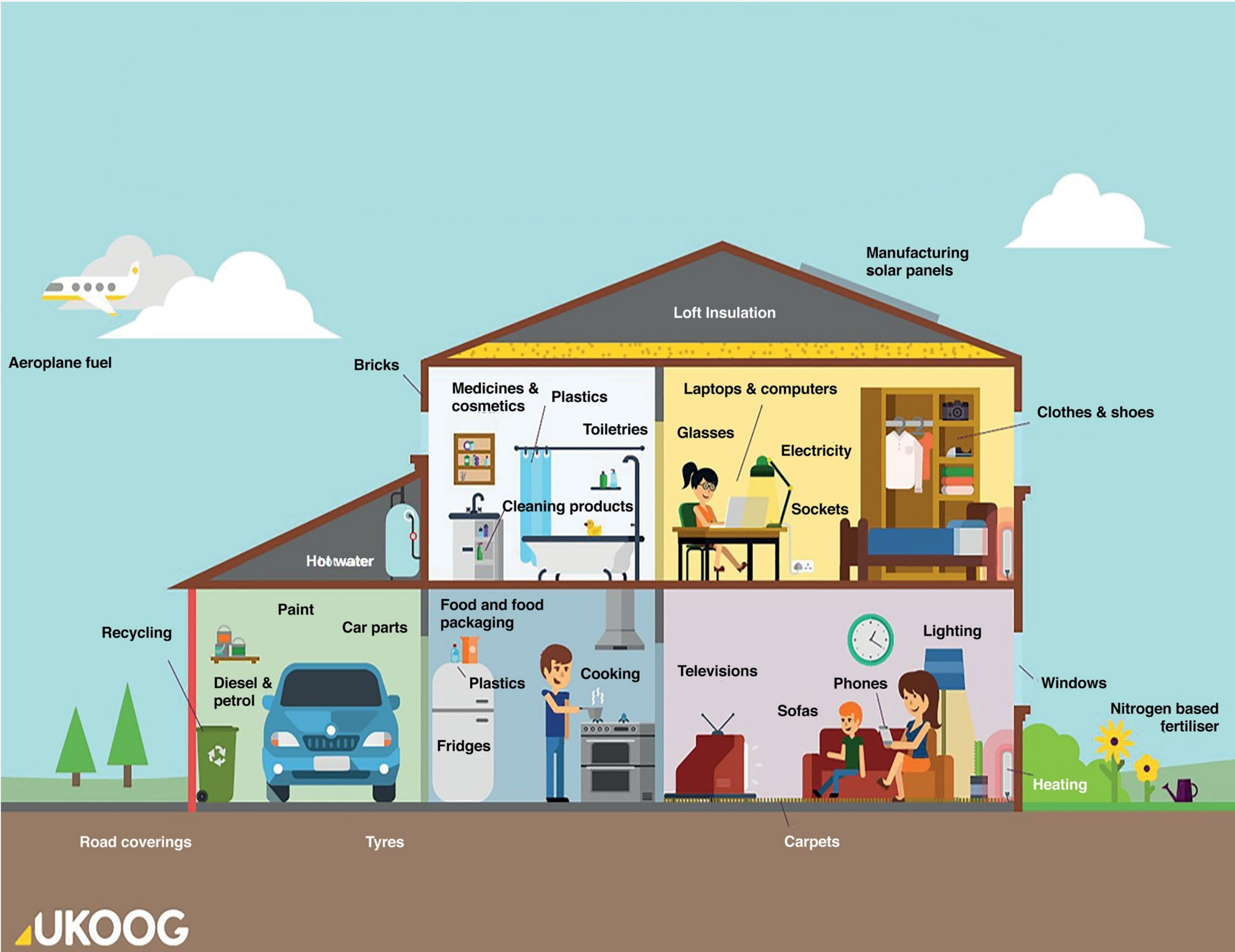
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GAS USE IN THE UK

In 2016, the UK obtained over 80% of its primary energy from fossil fuels, predominantly from oil and gas, over 40% of which was imported.

Previously self-sufficient for gas, the UK became a net importer in 2004, as North Sea production declined. The UK now imports approximately half its current gas requirement, via pipeline and as liquified natural gas (LNG), and this import dependency is estimated to rise to over 70% by 2030.



84% of UK homes are heated by gas

61% of UK homes use gas for cooking

Gas provided ~40% of UK electricity in 2016



~500,000 jobs in UK industries depend on gas as a feedstock

Glass recycling furnaces use 1 million cubic metres of gas every day

The UK will require gas for decades to come as both fuel and feedstock. The only question is whether we import the gas that we need from overseas, with the resultant damage to the UK economy, or whether we explore for and produce our own gas in the UK. Shale gas in Lancashire can potentially make a significant contribution in the years ahead.



In January 2018, the UK received a shipment of liquified natural gas (LNG) from the Yamal project in the Russian Arctic. This cargo was delivered by the ice-breaker LNG tanker ‘Christophe de Margerie’.

The Committee on Climate Change estimate that UK shale gas will have life-cycle emissions 10% lower than LNG imports.

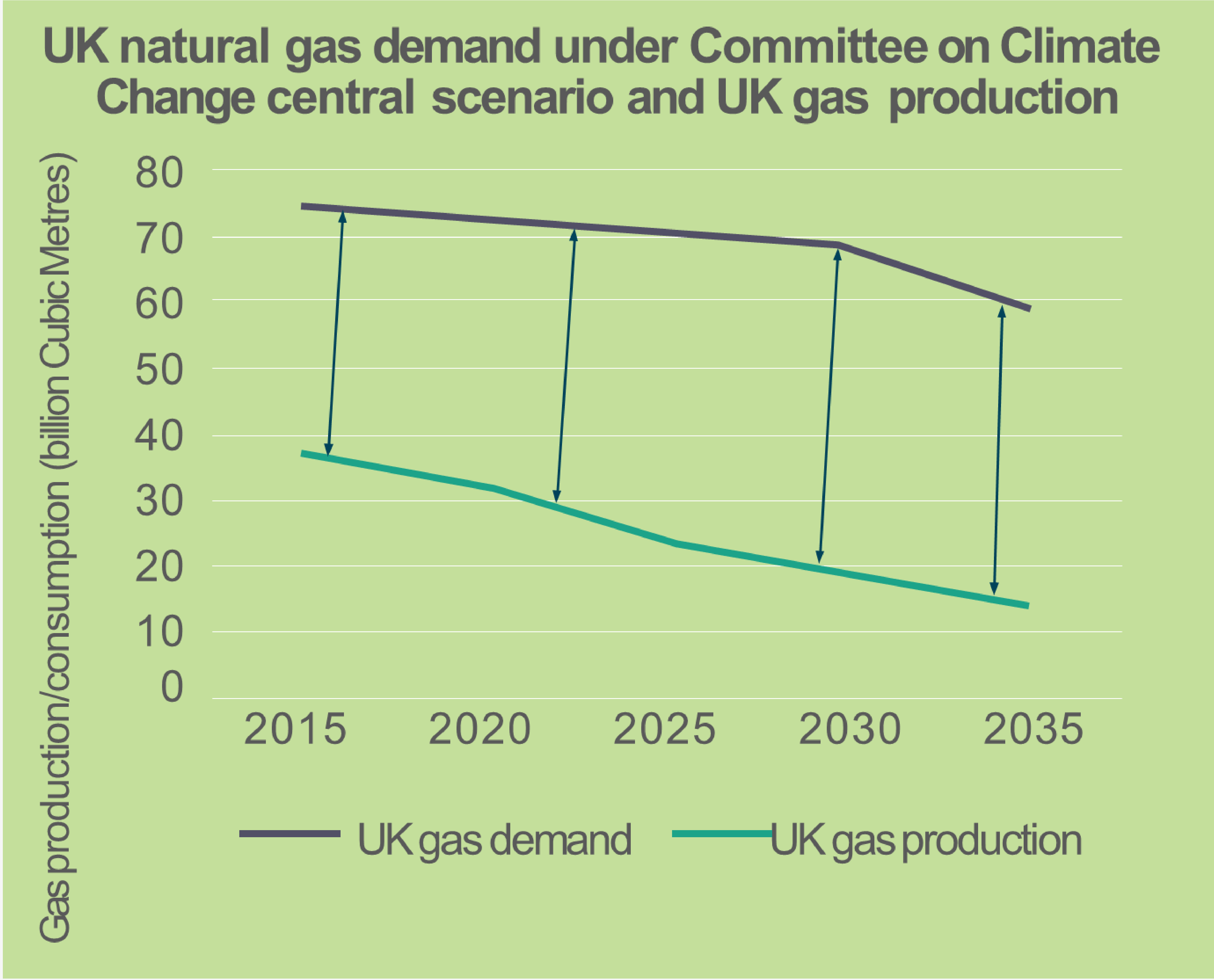
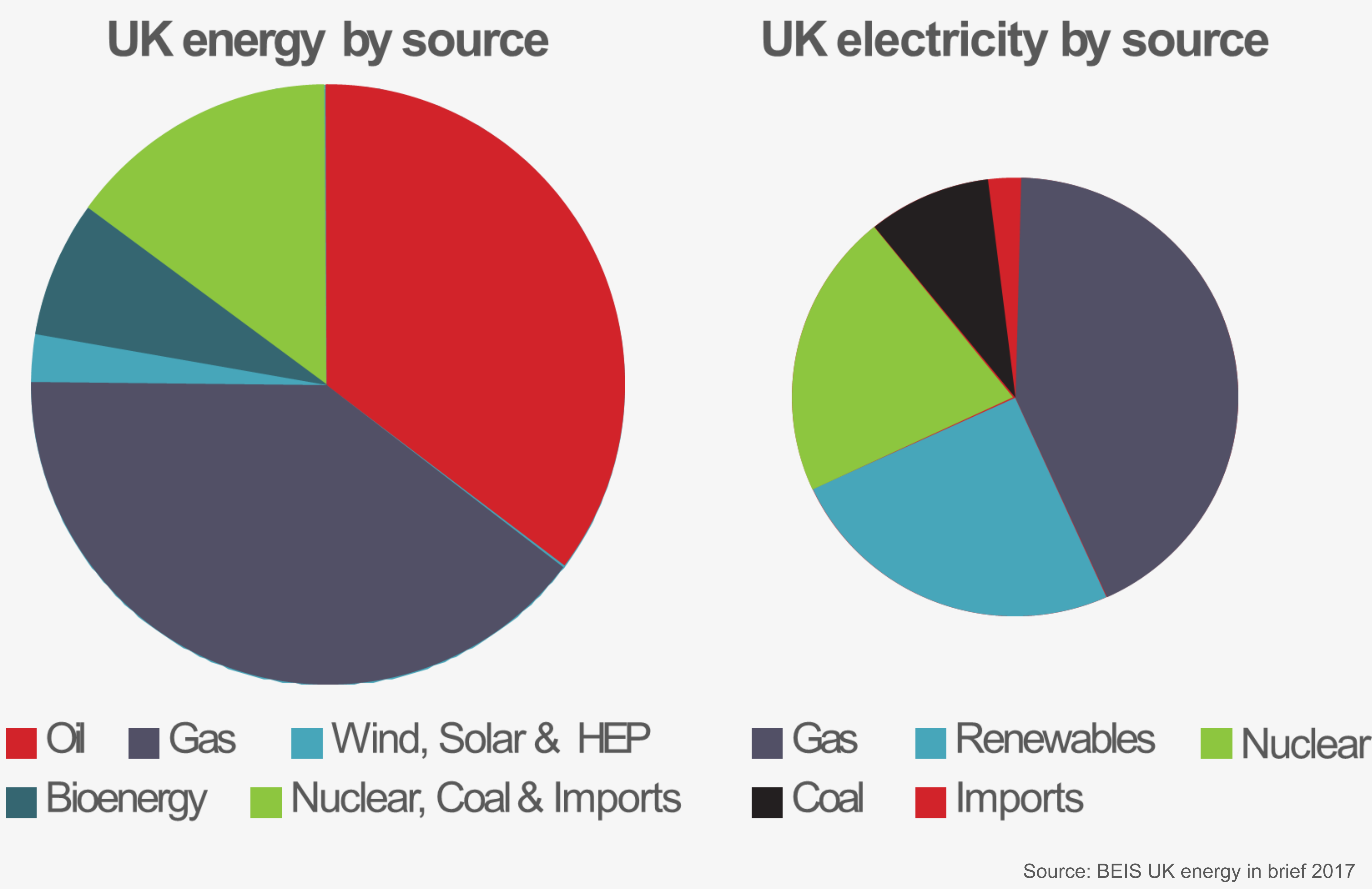
GAS IN ENERGY MIX

Gas is a significant component of the UK’s energy mix and the largest single source of UK electricity generation. Cheap and available 24/7, gas provides essential back-up to the UK’s growing, but intermittent, renewable sector.

As electricity generation from coal is phased out, gas will likely have a greater role in baseload generation and/or as a balancing fuel.

“Gas is critical to security of supply now and as Britain continues the transition to a low carbon economy’

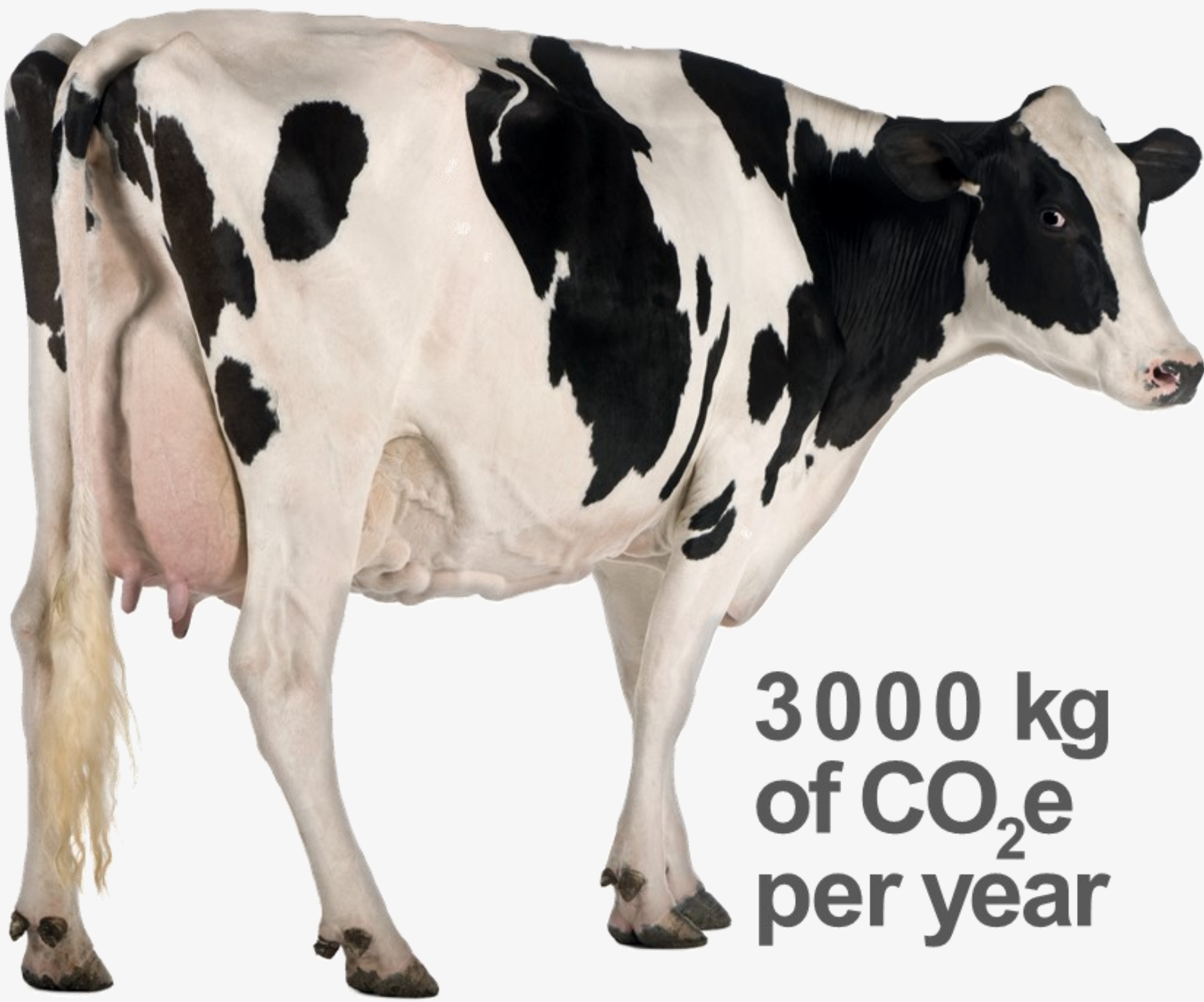
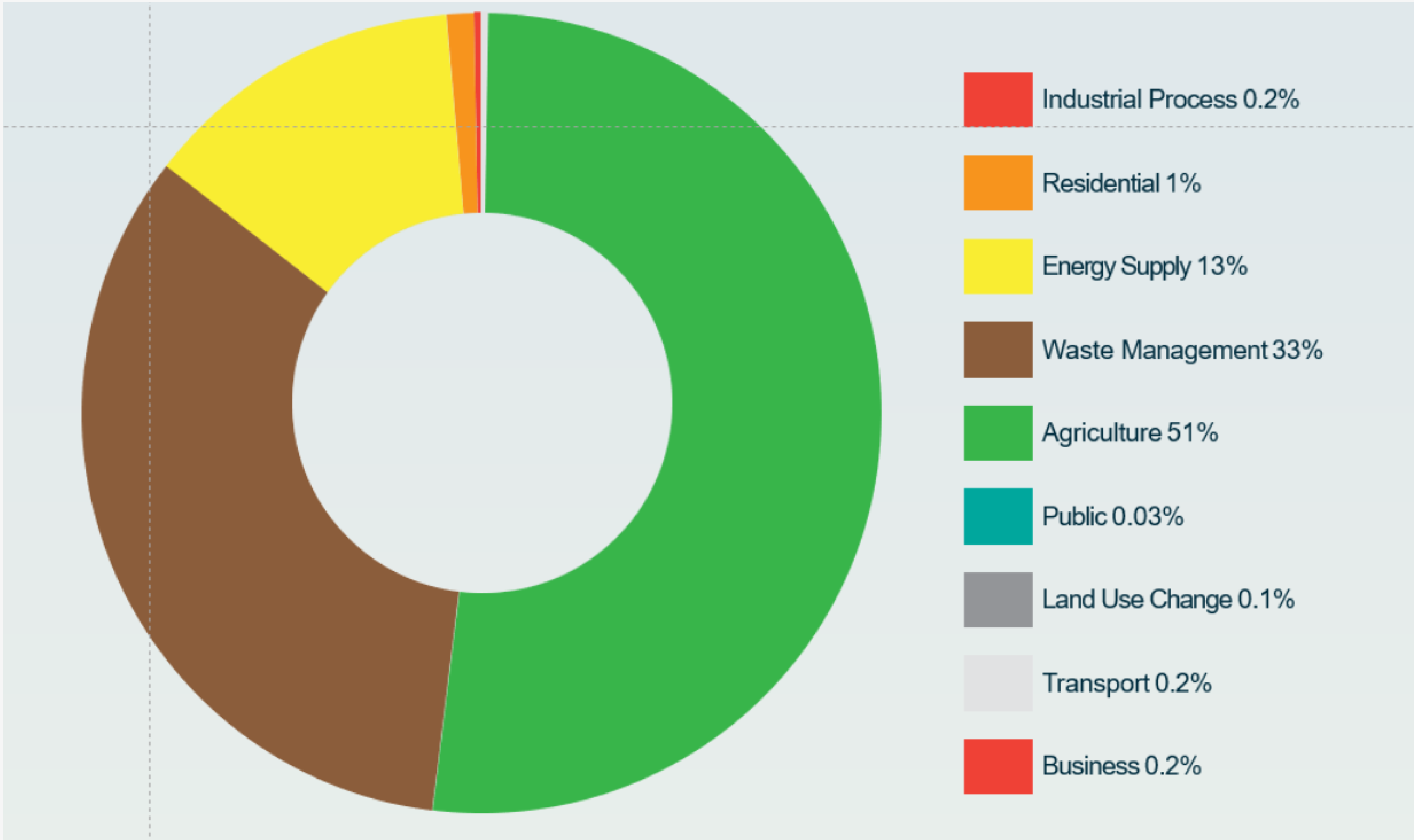
National Grid ‘The Future of Gas Progress Report’



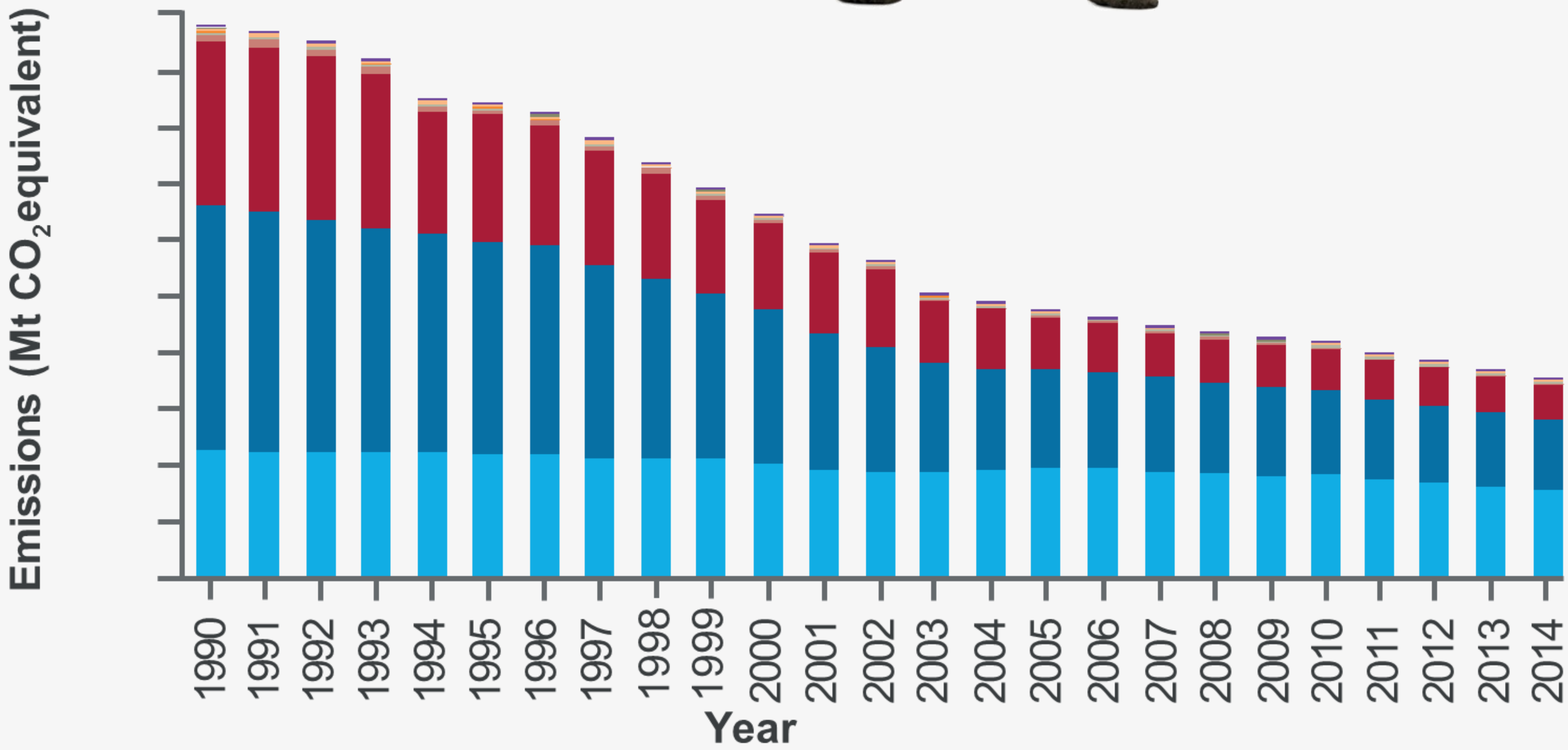
Source: UK Committee on Climate Change



METHANE EMISSIONS

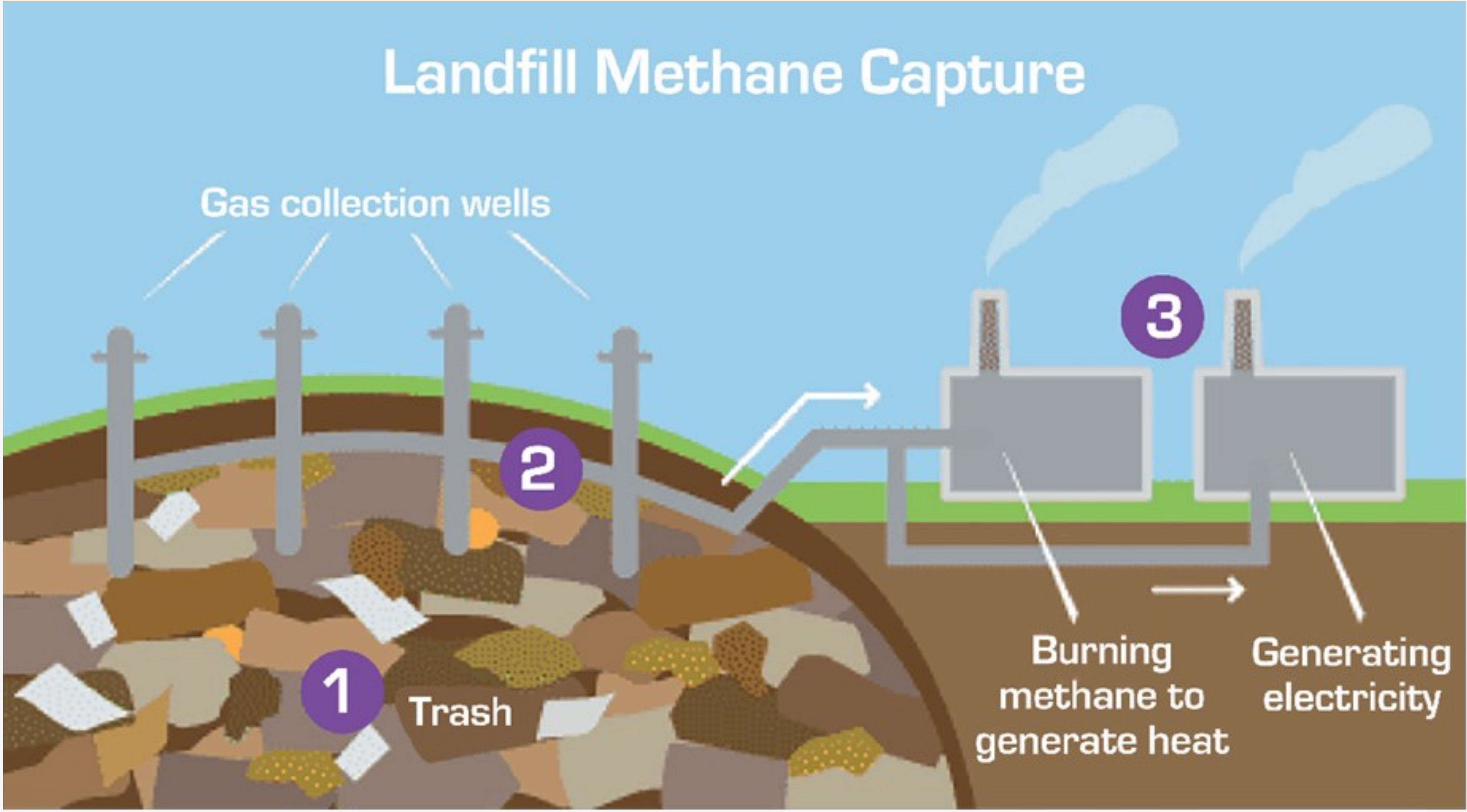


3000 kg
of CO₂e
per year



Key

Other	Business	Transport	Energy Supply
Land Use Change	Residential	Industrial Process	Waste Management
Agriculture			

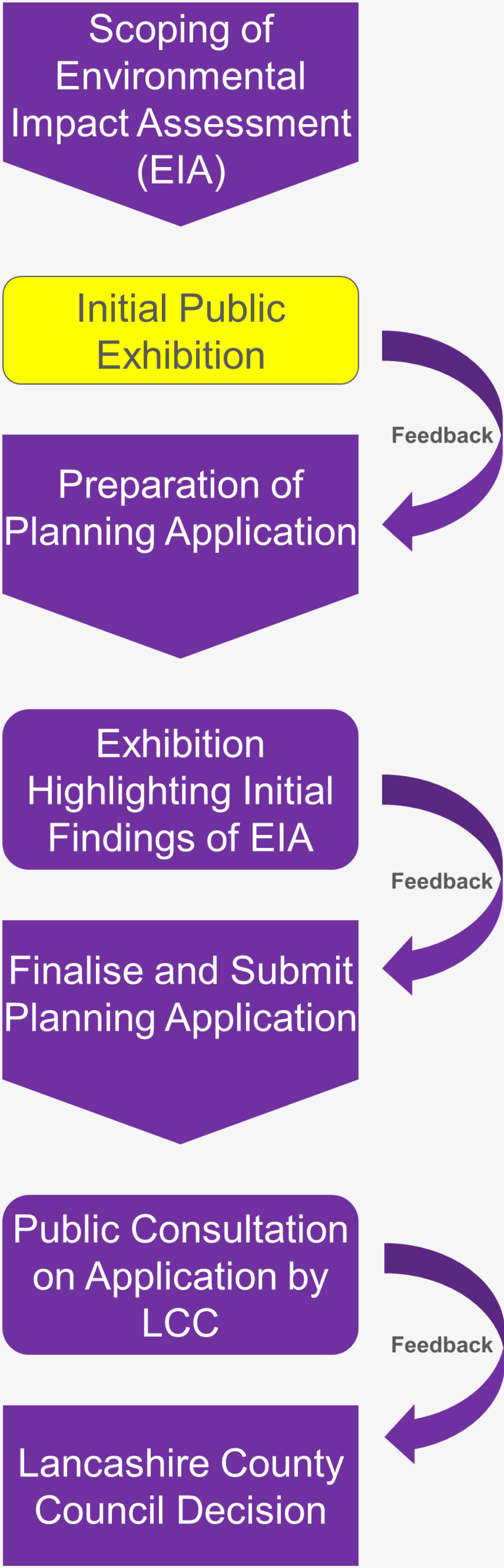


Sources: BEIS

NEXT STEPS

Lancashire County Council’s Scoping Opinion will define the topics to be addressed in the Environmental Statement to be submitted with the full planning application.

There will be further opportunities to comment on the proposed development throughout the planning process as illustrated below:



As our plans progress, we will provide a regular residents’ newsletter, set up a community liaison group and provide a dedicated website where all relevant information on the project can be accessed.

Aurora welcome feedback on the proposed development at any time. Such feedback can be addressed to the e-mail address below.



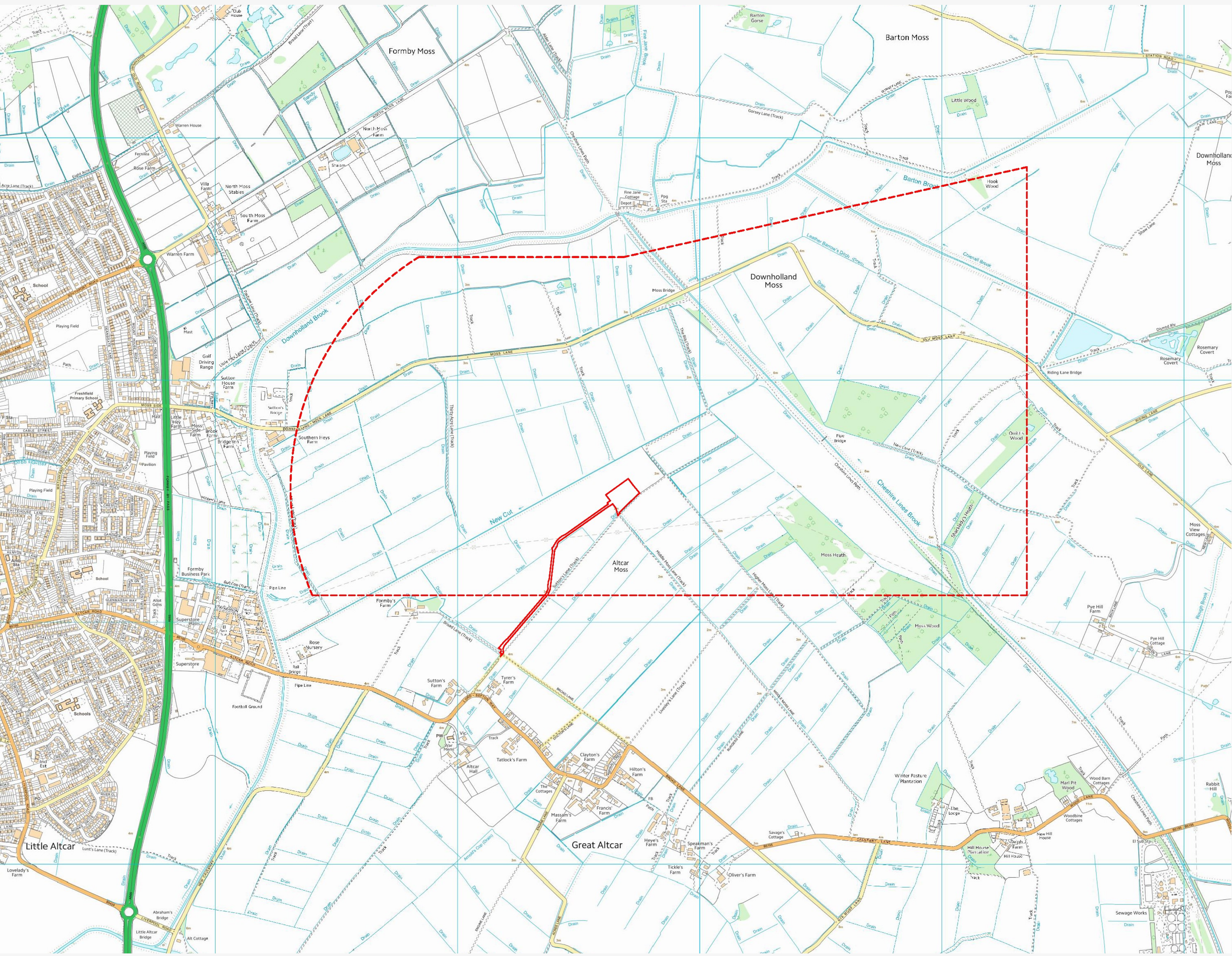
APPENDIX B – DISPLAY BOARDS SECOND PUBLIC INFORMATION EVENT

WELCOME TO OUR INFORMATION EVENT

Thank you for visiting today. This is an opportunity for you to find out more about our plans for the proposed Altcar Moss site and to see some of the results of the various studies that have been conducted to inform the Environmental Impact Assessment for the project. Members of the project team are on hand and will be happy to answer any questions.

Once finalised, the planning application and related Environmental Statement will be submitted to Lancashire County Council as the relevant Mineral Planning authority for the Altcar Moss site.

In addition, Aurora will be submitting a series of environmental permit applications to the Environment Agency covering the proposed operations.



Location of Altcar Moss site and access showing the area in which the proposed subsurface works will take place (dashed)

YOUR VIEWS

This is the second public information event for the Altcar Moss site and today we wish to present both an outline of the proposed development and highlight the key findings of the various work streams, covering key areas of interest, that form the basis of the project's Environmental Statement.

Once you have had an opportunity to look at our proposals and to talk with members of the team, please fill in one of our feedback forms. If you would prefer, these can be taken away and sent to us later at the email address below.

Your views on the proposals are important to us and appreciated. We will review all comments received and will consider them as we finalise the planning application.

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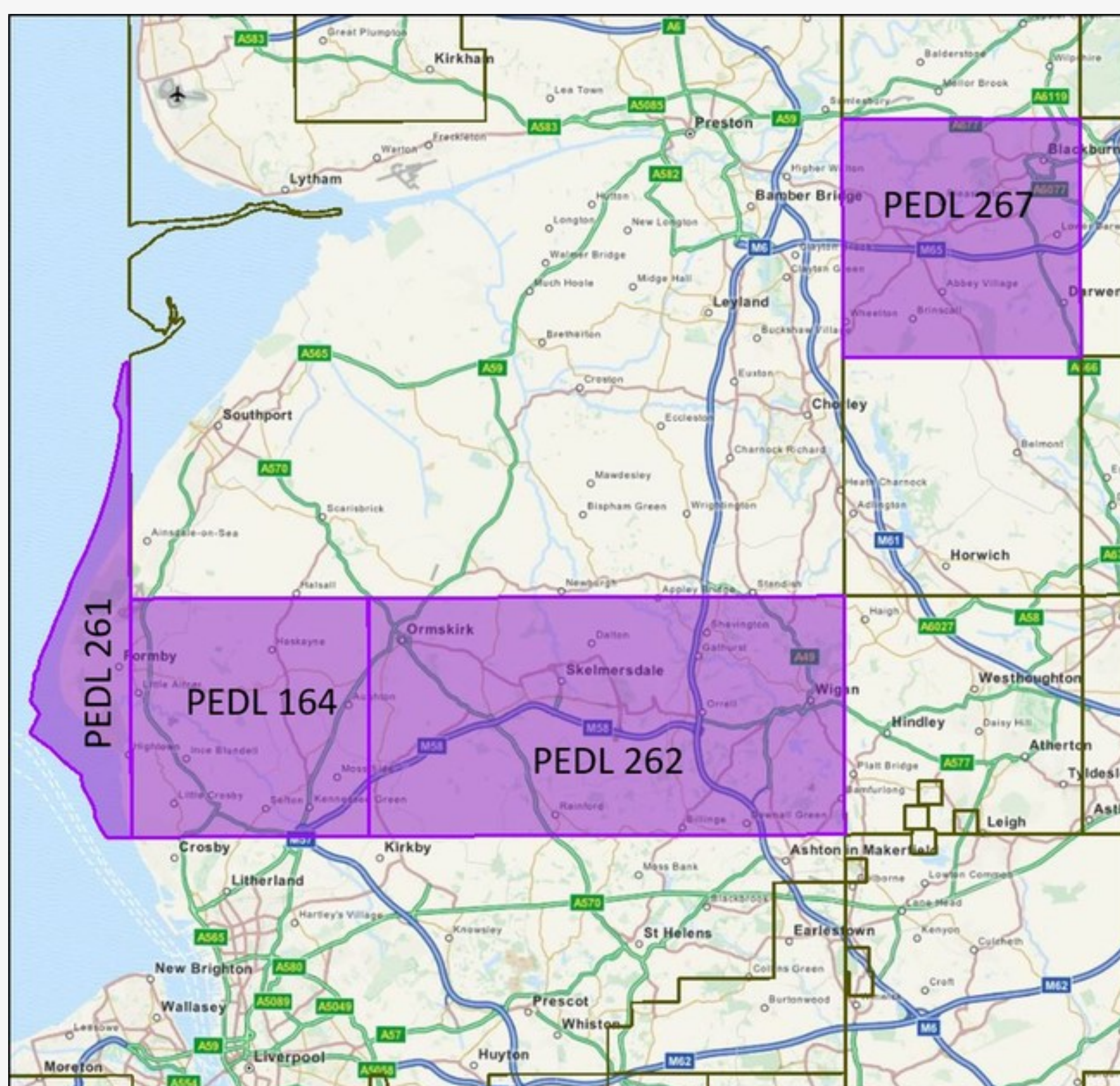


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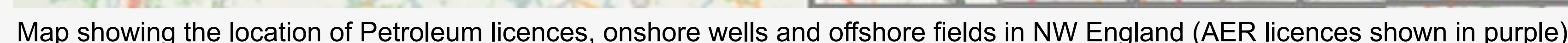
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A vertical photograph of a lush green wheat field. The foreground is filled with tall, vibrant green wheat stalks, showing the developing grain heads. The field stretches out towards a distant horizon where a small red tractor is visible, working the land. The sky above is a clear, bright blue, dotted with soft, white clouds. The overall scene conveys a sense of agricultural productivity and natural beauty.

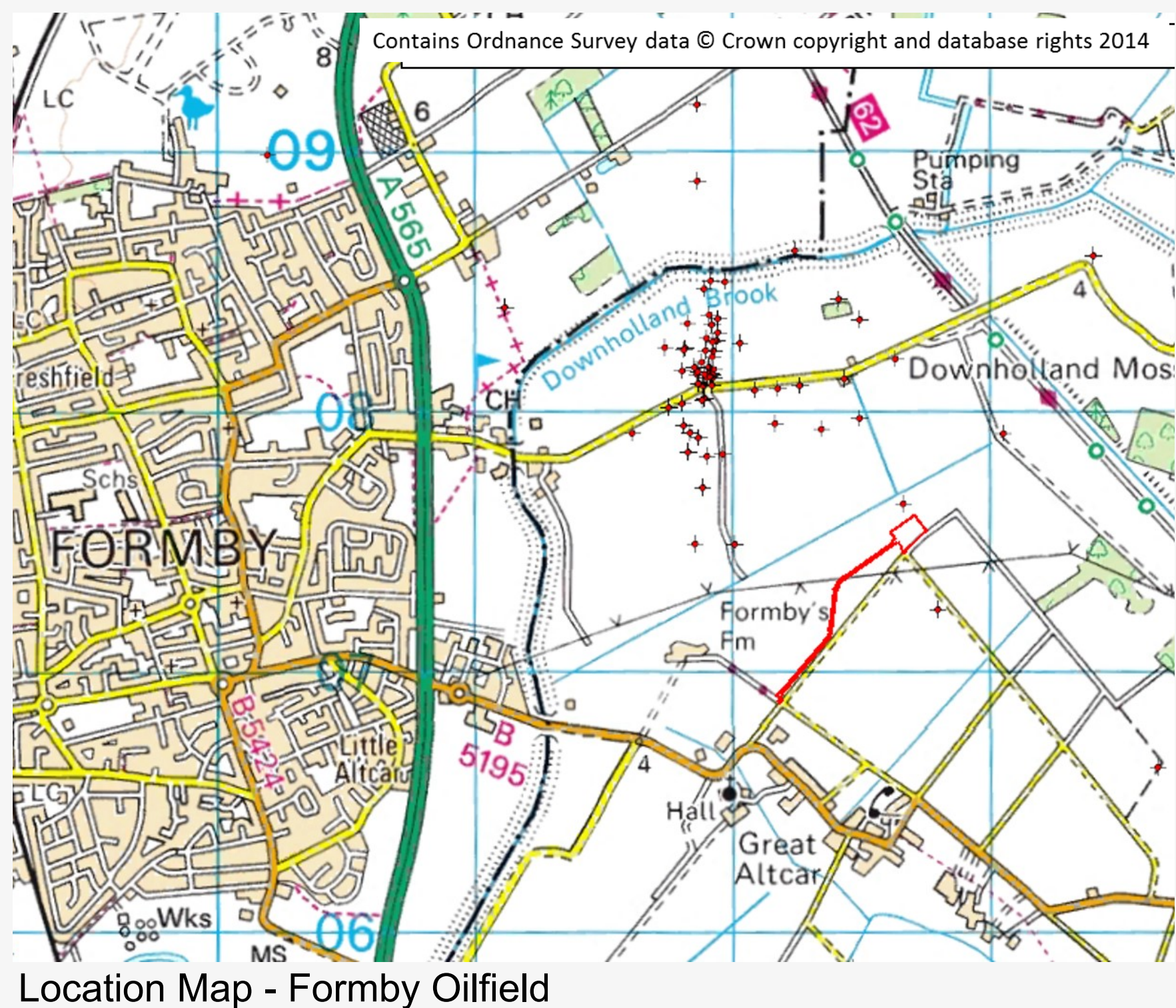
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2017/18	Cuadrilla Resources have drilled and are currently testing two wells at Preston New Road, Lancs.

FORMBY OILFIELD

When people think of oil & gas in the UK, they generally picture oil rigs and platforms in the harsh environments of the North Sea. However, one of the first commercial oil discoveries in the country was made onshore on Downholland Moss, near Formby, shortly before the Second World War.



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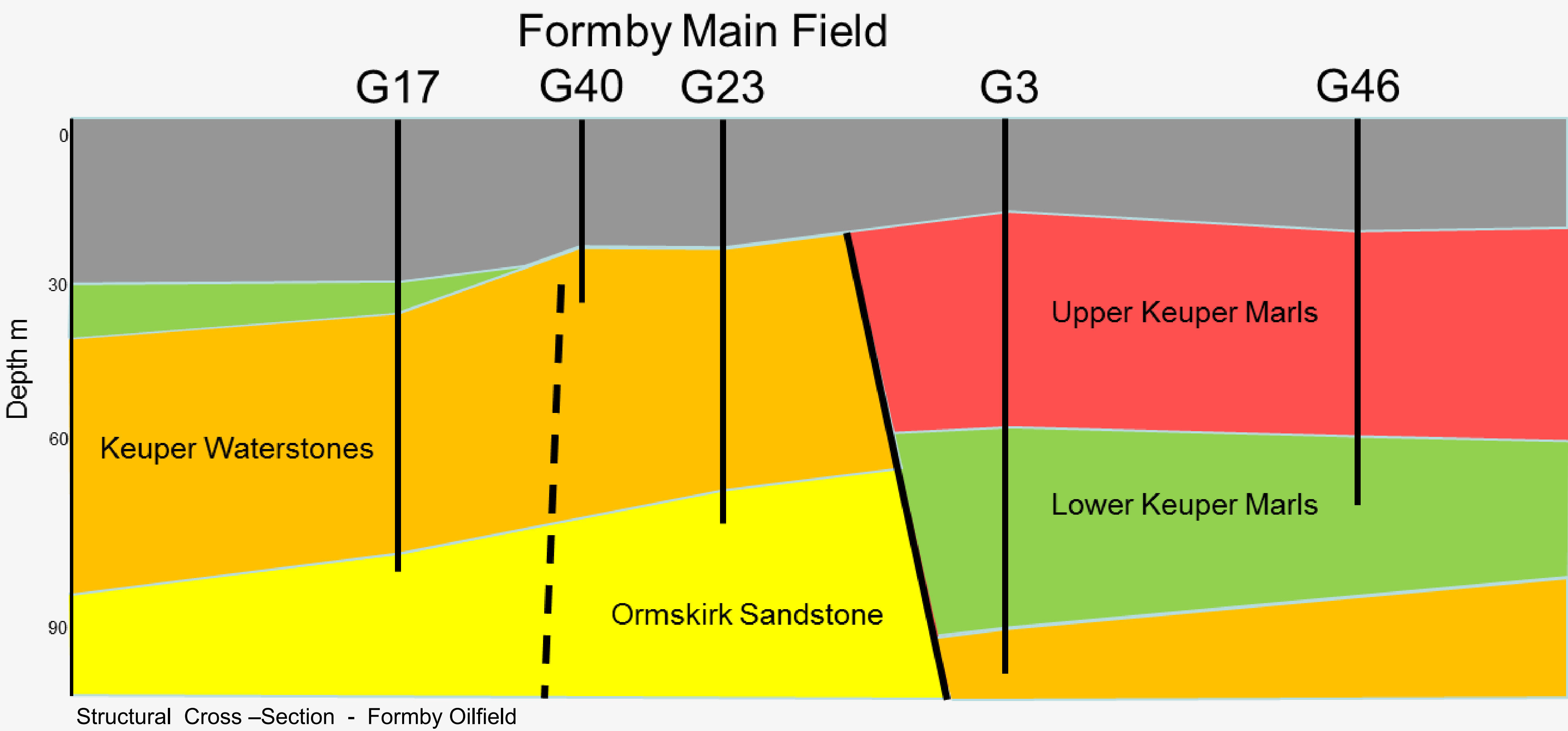
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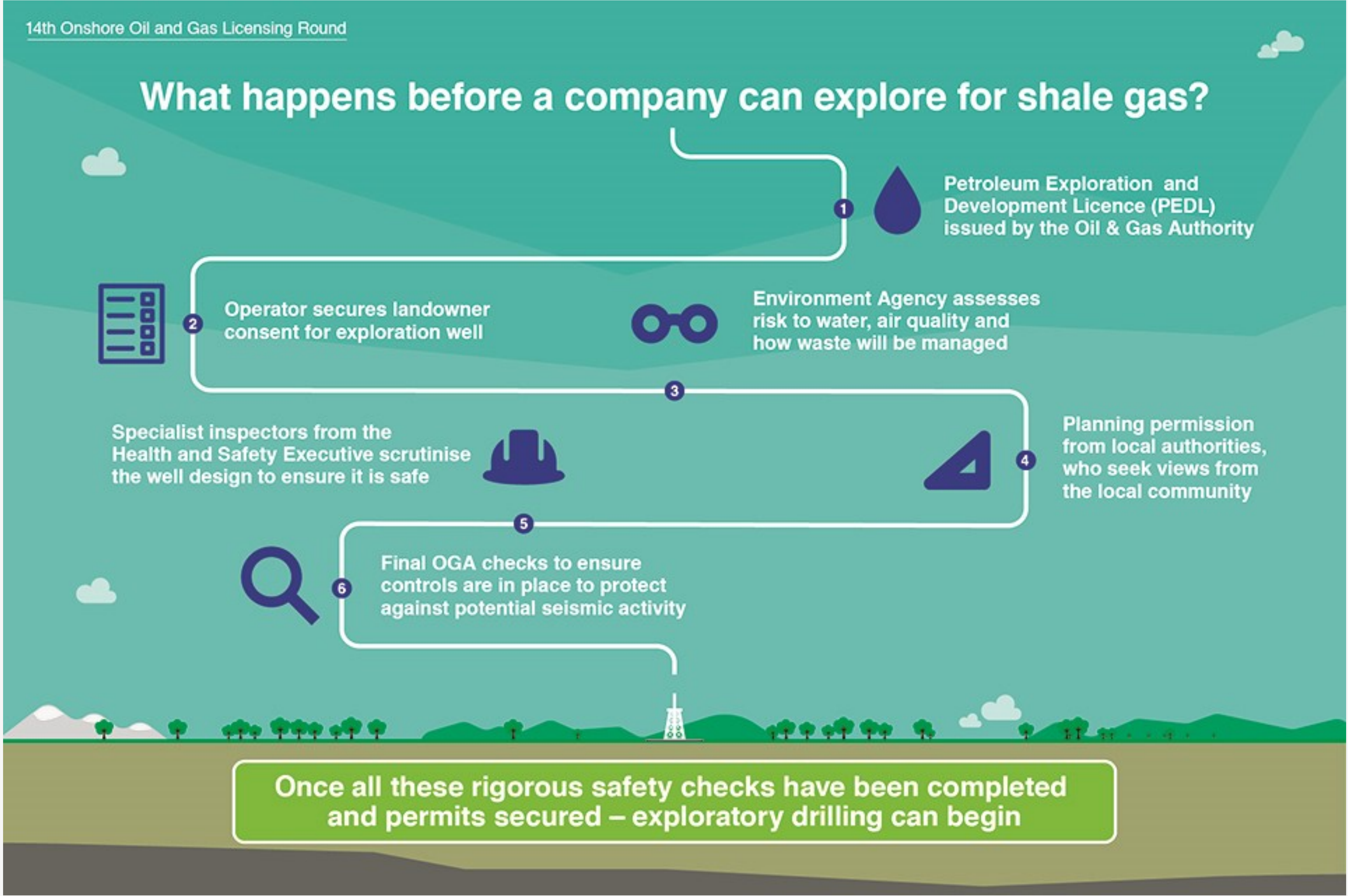
Description of the oil recovered from Formby oil seeps in Camdens’s Britannia, 1637



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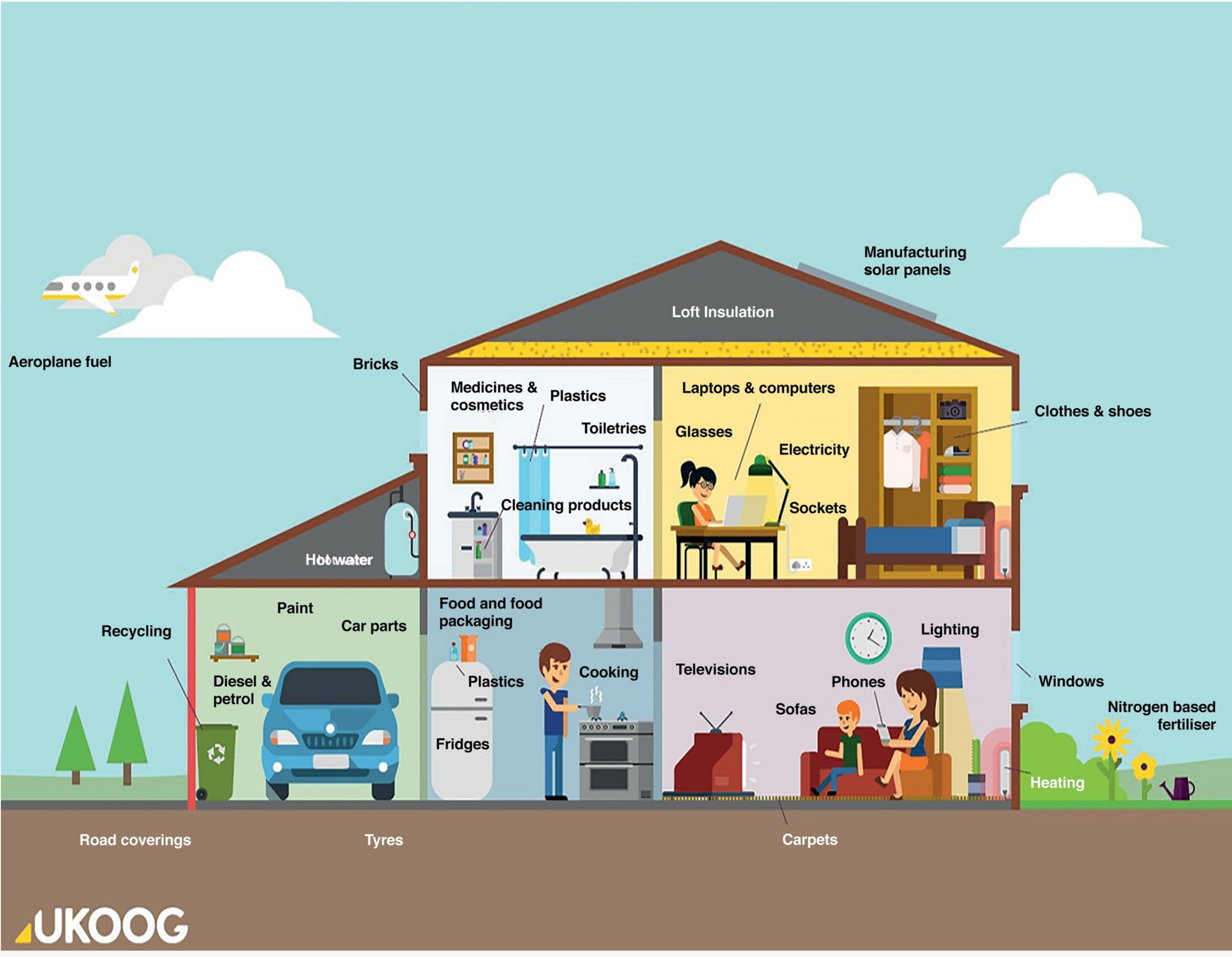
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(Mon-Fri 9-5:30pm)



GAS USE IN THE UK

In 2017, the UK obtained over 80% of its primary energy from fossil fuels, predominantly from oil and gas, over 40% of which was imported.

Previously self-sufficient for gas, the UK became a net importer in 2004, as North Sea production declined. The UK now imports approximately half its current gas requirement, via pipeline and as liquified natural gas (LNG), and this import dependency is estimated to rise to over 70% by 2030.



84% of UK homes are heated by gas

61% of UK homes use gas for cooking

Gas provided ~40% of UK electricity in 2017



~500,000 jobs in UK industries depend on gas as a feedstock

Glass recycling furnaces use 1 million cubic metres of gas every day

The UK will require gas for decades to come as both fuel and feedstock. The only question is whether we import the gas that we need from overseas, with the resultant damage to the UK economy, or whether we explore for and produce our own gas in the UK. Shale gas in Lancashire can potentially make a significant contribution in the years ahead.



In January 2018, the UK received a shipment of liquified natural gas (LNG) from the Yamal project in the Russian Arctic. This cargo was delivered by the ice-breaker LNG tanker ‘Christophe de Margerie’.

The Committee on Climate Change estimate that UK shale gas will have life-cycle emissions 10% lower than LNG imports.

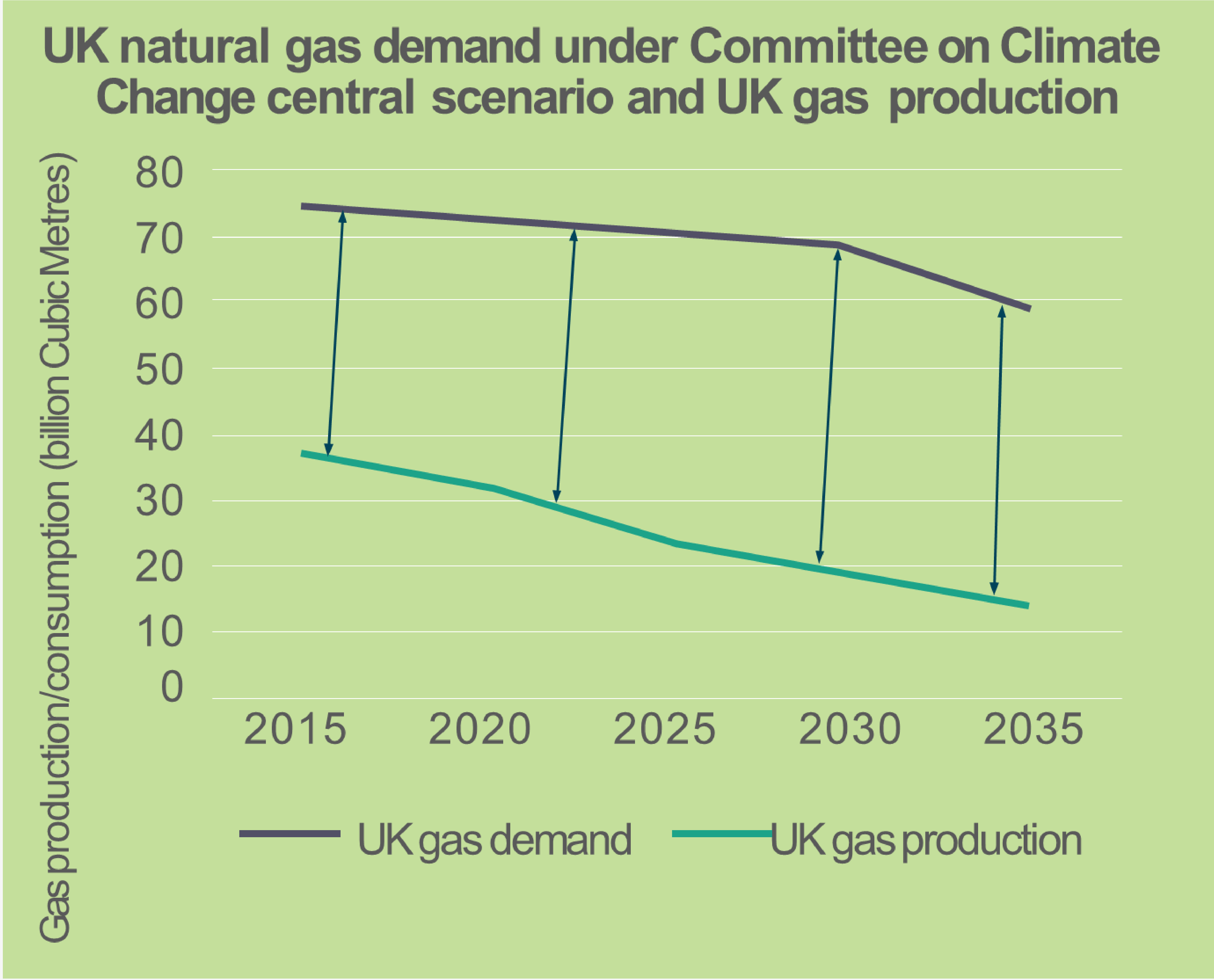
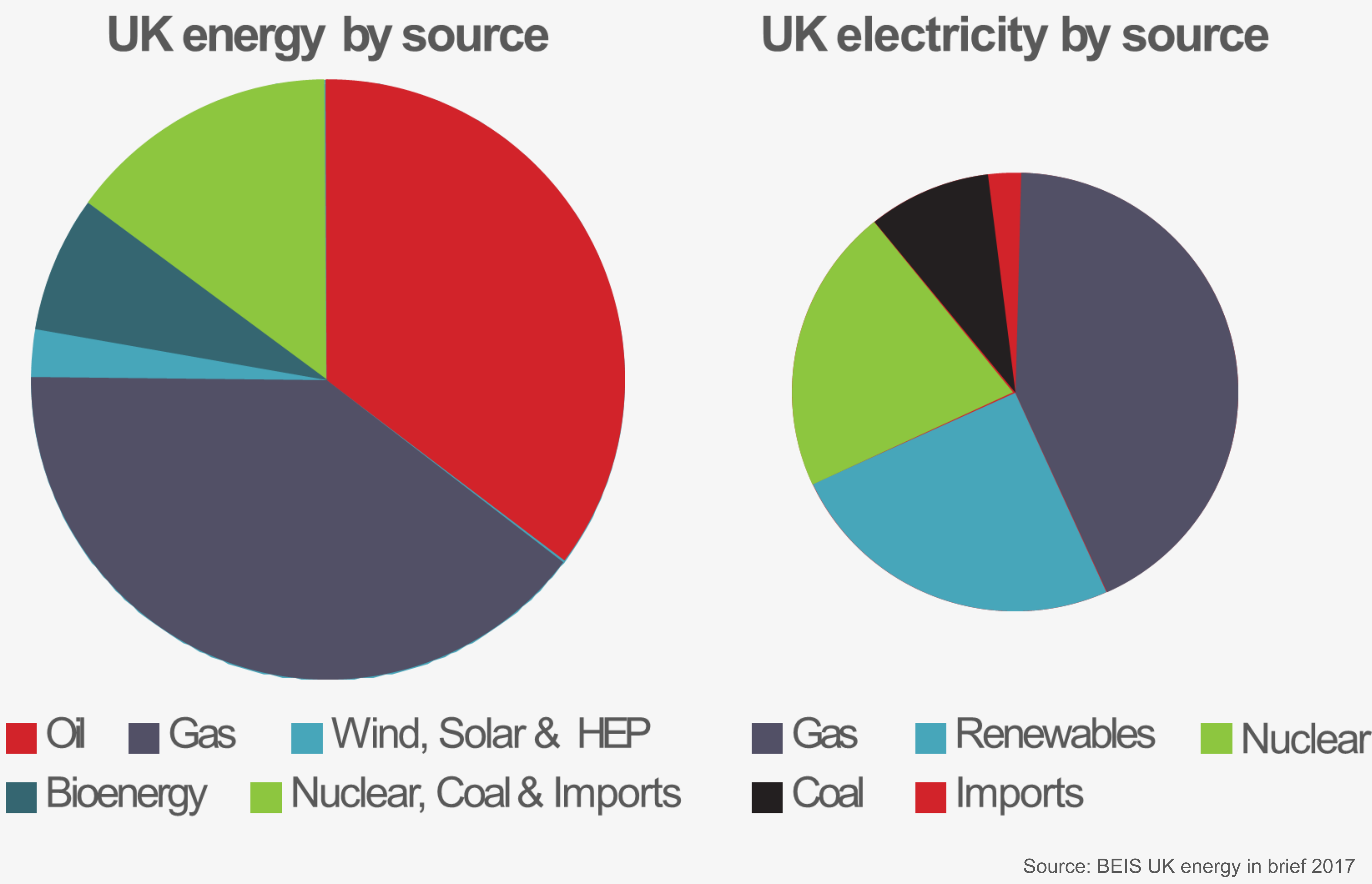
GAS IN THE ENERGY MIX

Gas is a significant component of the UK’s energy mix and the largest single source of UK electricity generation. Cheap and available 24/7, gas provides essential back-up to the UK’s growing, but intermittent, renewable sector.

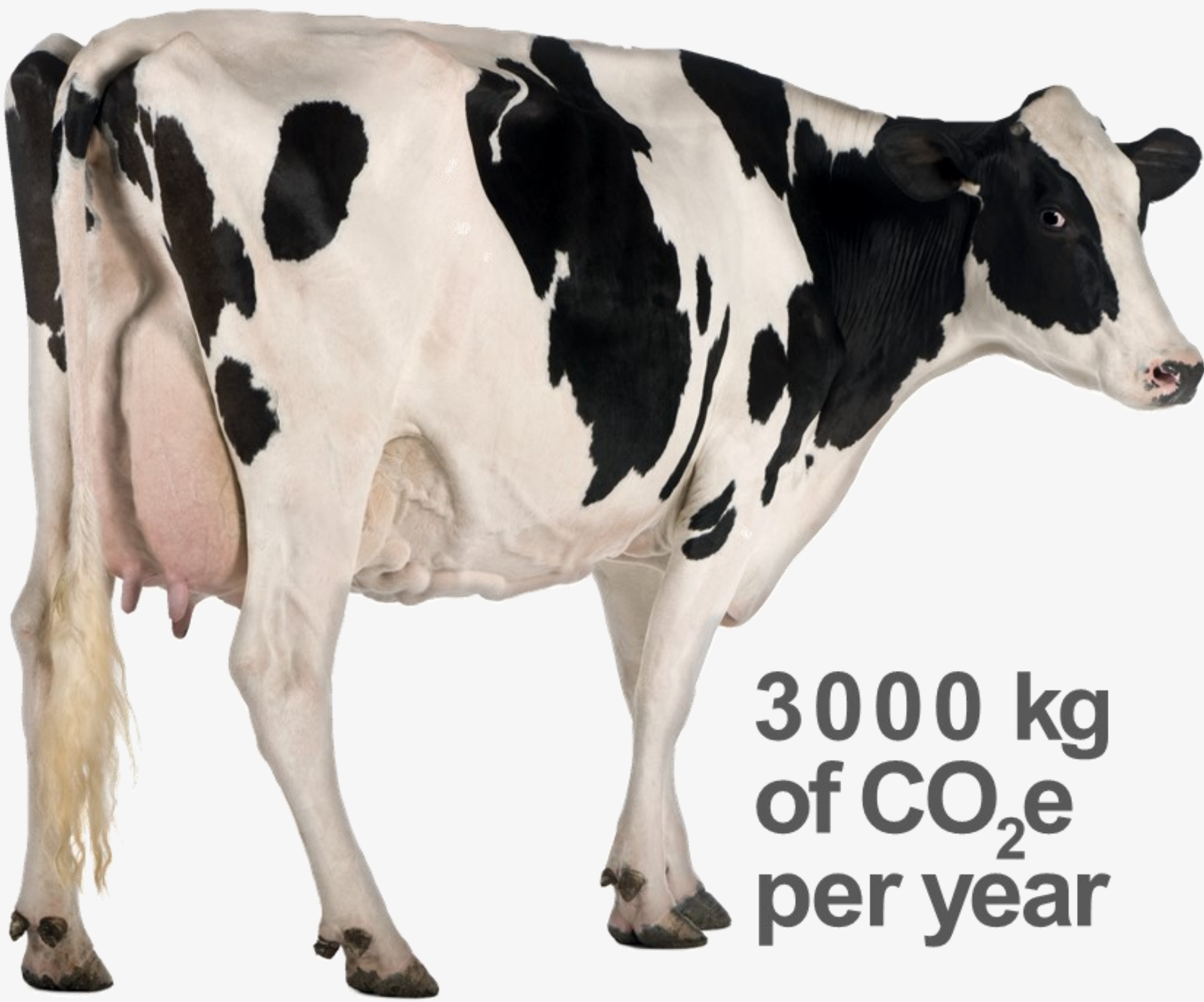
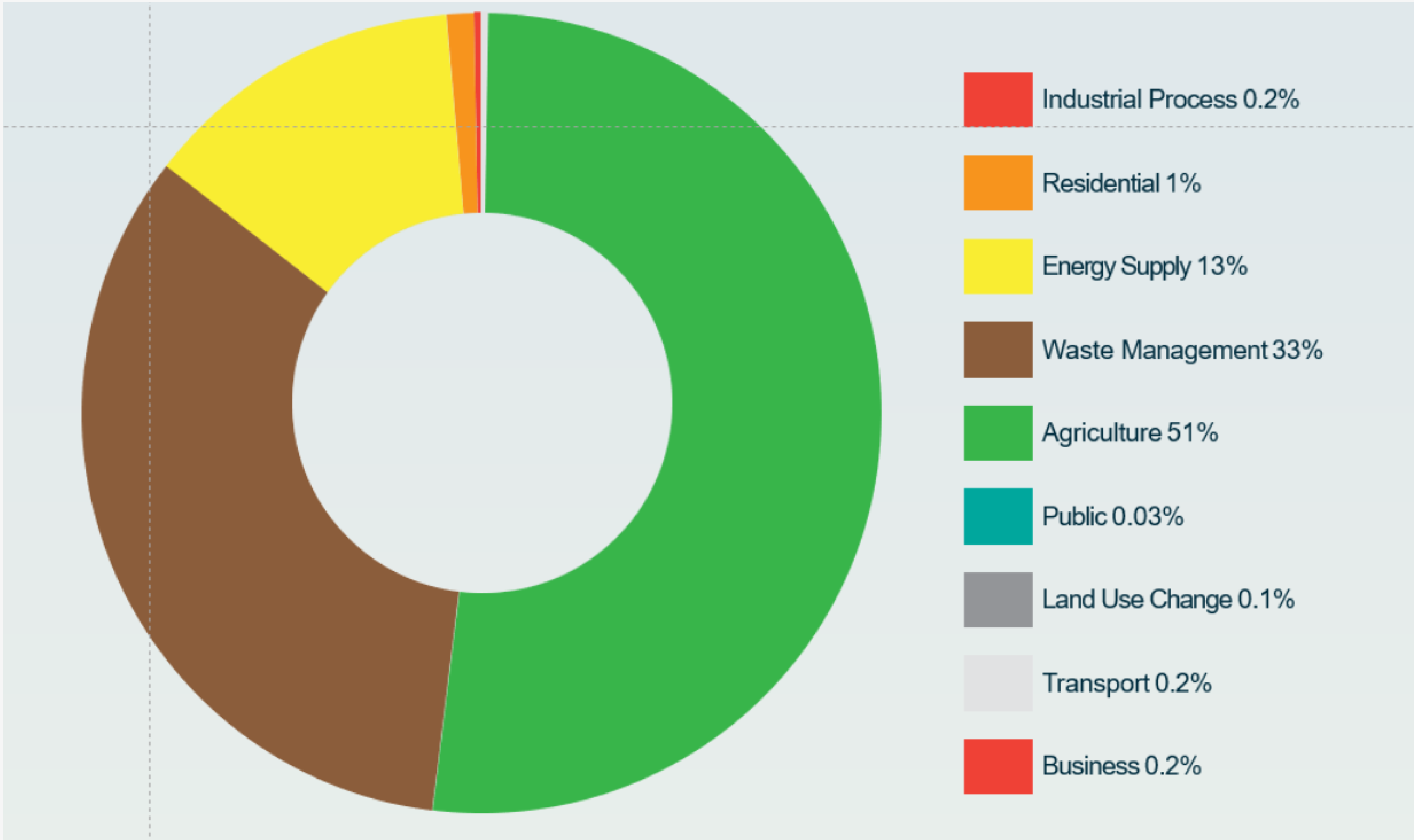
As electricity generation from coal is phased out, gas will likely have a greater role in baseload generation and/or as a balancing fuel.

“Gas is critical to security of supply now and as Britain continues the transition to a low carbon economy’

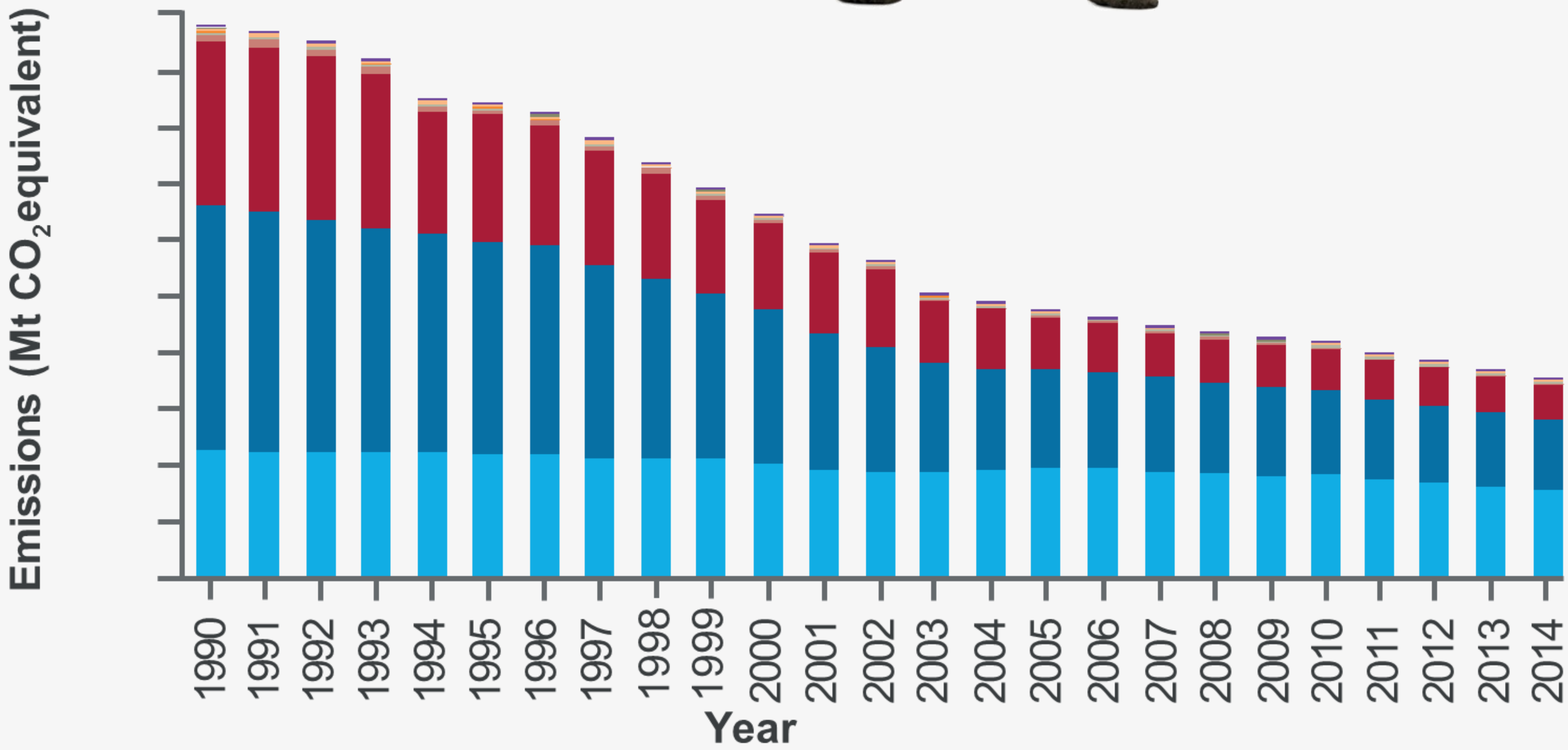
National Grid ‘The Future of Gas Progress Report’



METHANE EMISSIONS

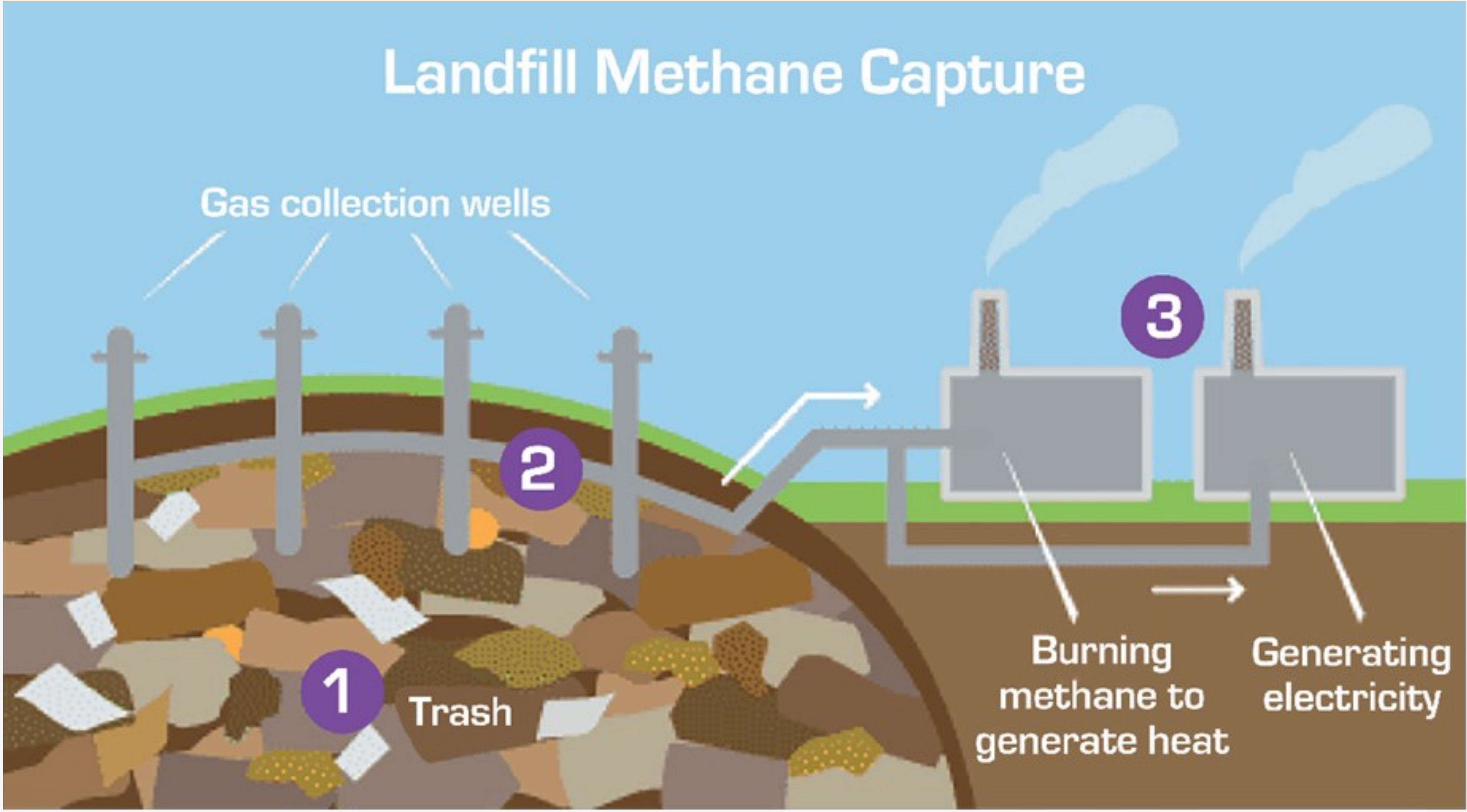


3000 kg
of CO₂e
per year



Key

Other	Business	Transport	Energy Supply
Land Use Change	Residential	Industrial Process	Waste Management
Agriculture			



Sources: BEIS



THE ALT CAR MOSS SITE

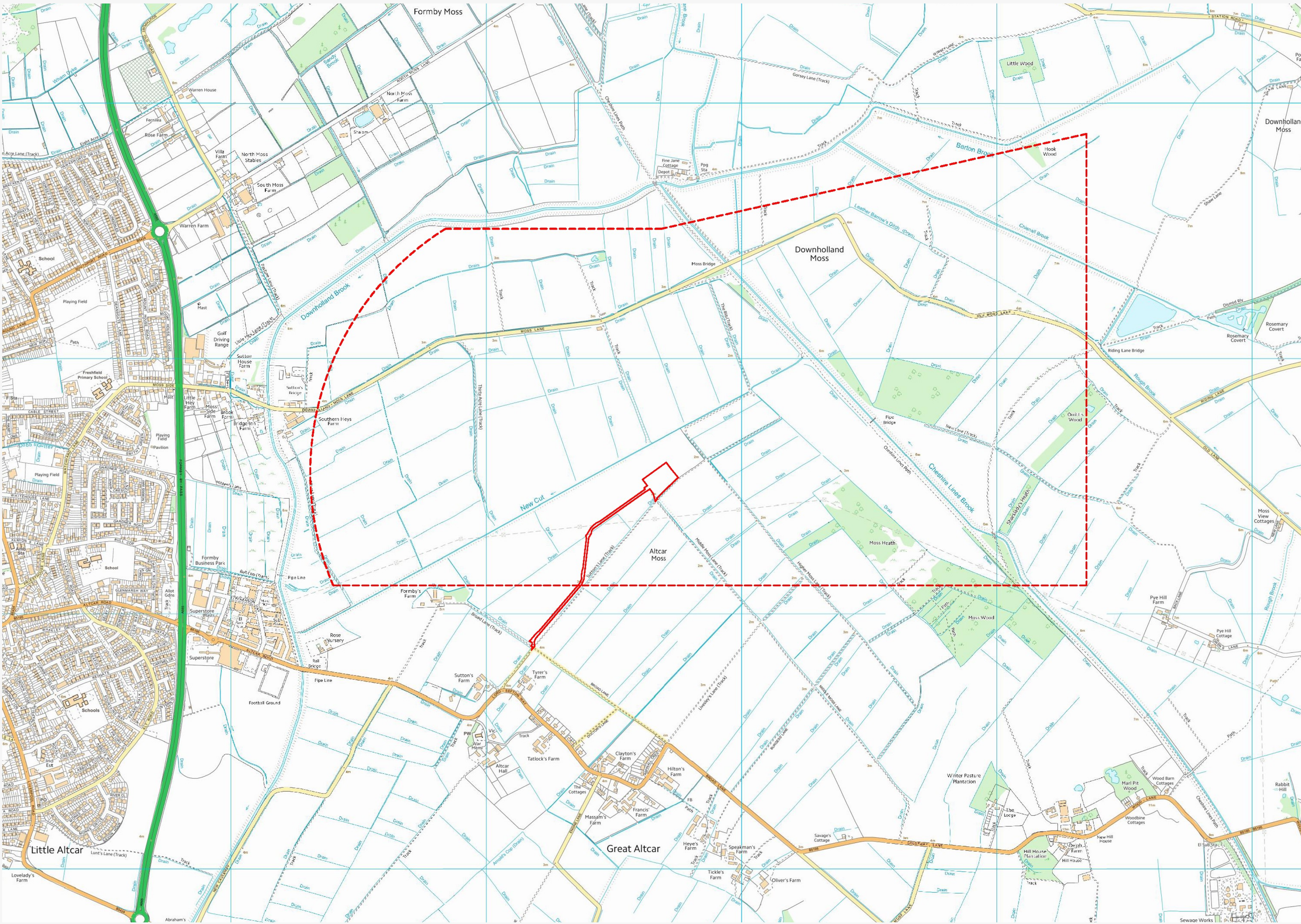
The proposed Altcar Moss wellsite is located in West Lancashire to the north of the village of Great Altcar, within Aurora's PEDL 164 licence.

The site was chosen following an evaluation of the 3D geophysical survey acquired in 2016 and following a review of a number of potentially suitable surface locations in the area.

The proposed site is located ~850 m from the closest property, but close to good transport infrastructure.

Aurora proposes to drill and test both a vertical and a separate horizontal borehole at Altcar Moss to evaluate the potential to produce hydrocarbons from deeply-buried, Carboniferous-age rocks.

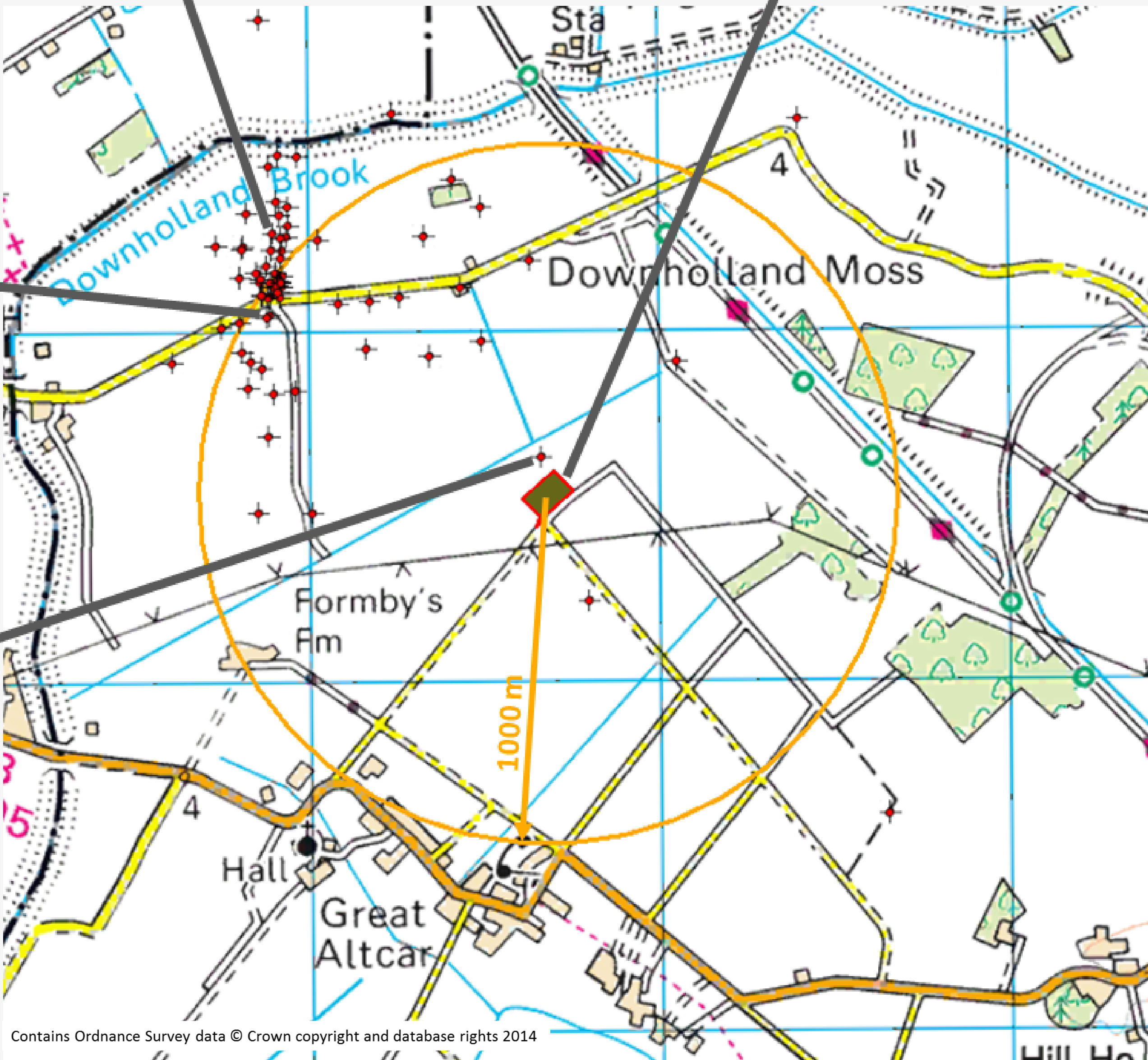
Both boreholes would undergo hydraulic fracture stimulation to gain important information on the ability of the various shale targets to flow oil and gas.



Formby shallow oilfield
1939-1965
Producing depth 130 ft (40 m) AER Altcar Moss Site

Formby-1
1940-1947
7,680 ft (2,341 m)
Gas in Bowland Shale

Altcar Borehole
1890-1892
1,091 ft (333 m)

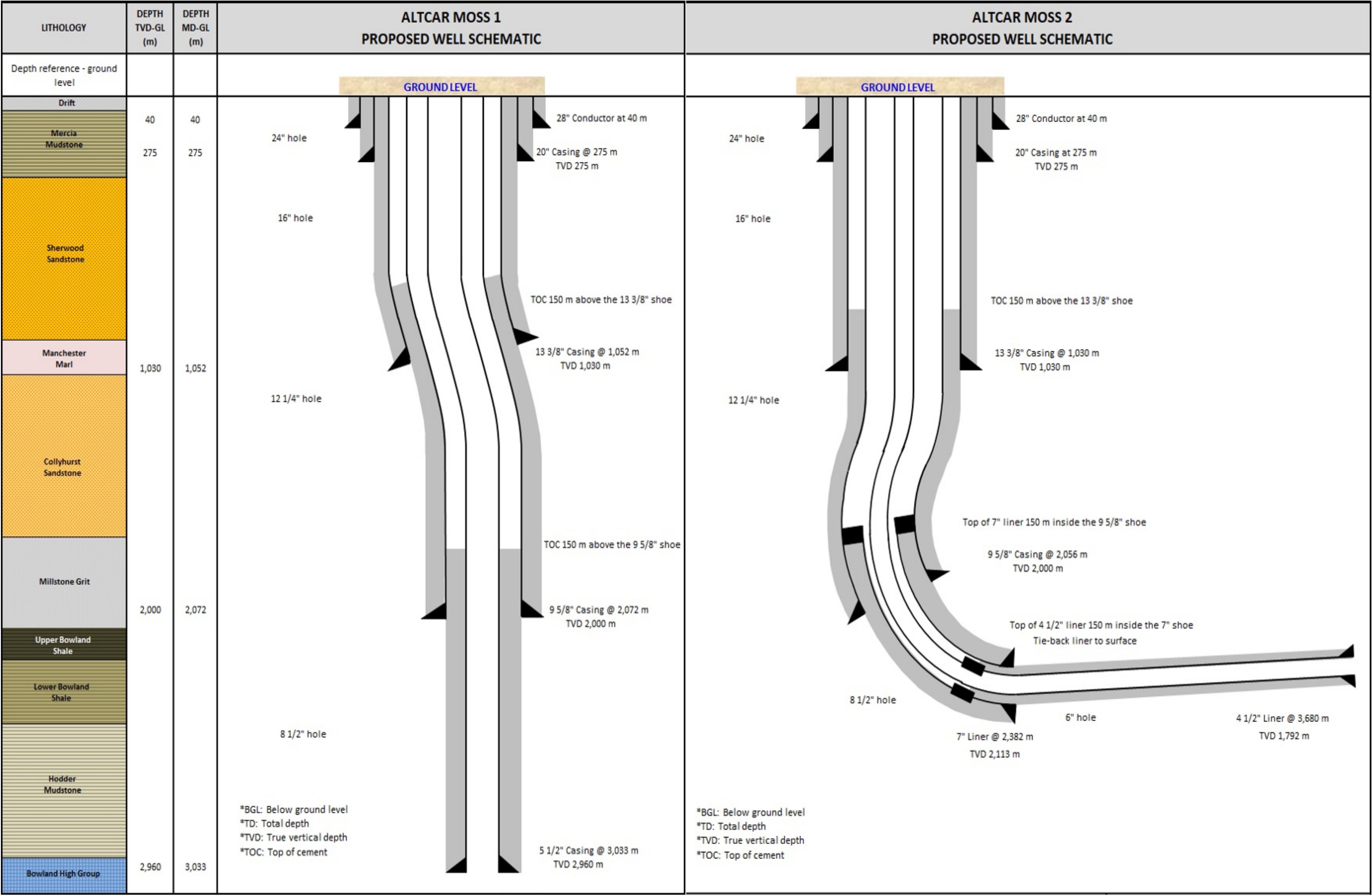


All surface drilling and fracturing operations would take place within a specially constructed wellsite, the operational area of which will be underlain by an impermeable membrane designed to protect the local environment.

Following the proposed operations, the site would either be restored to agricultural use or further applications would be made to retain the site for future production operations.



PROPOSED DEVELOPMENT

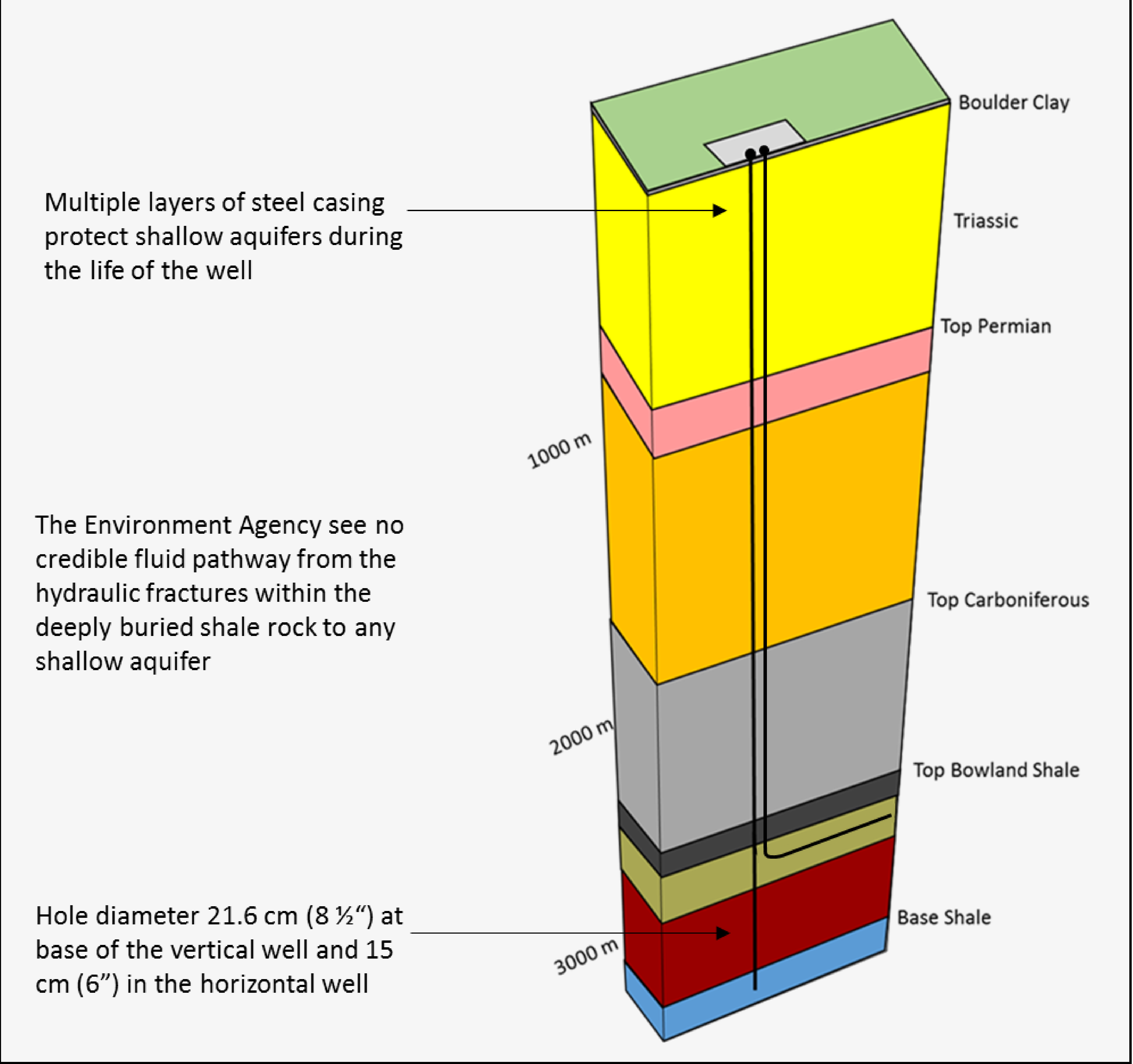


Schematic Well Design

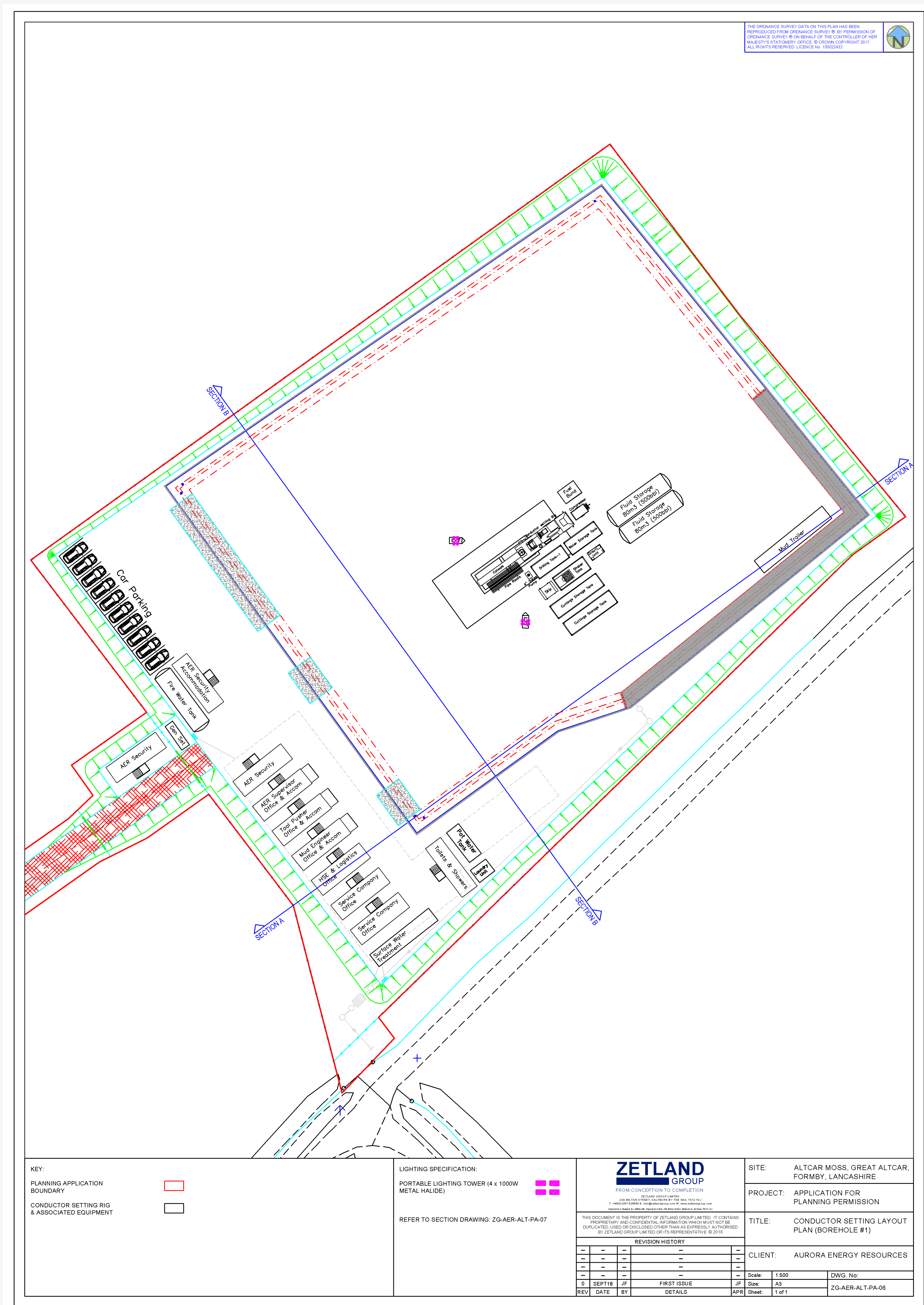
INDICATIVE DEVELOPMENT SCHEME

- Phase 1 – Wellsite and Access Track Construction (88 days)
- Phase 2 – Drilling and Coring of a Vertical Borehole (up to 5 months)
- Phase 3 – Drilling of a Horizontal Borehole (up to 5 months)
- Phase 4 – Hydraulic Fracture Stimulation of the Vertical and Horizontal Boreholes (60 days)
- Phase 5 – Initial Flow Testing (60 days)
- Phase 6 – Extended Well Test of the Horizontal Borehole (90 days)
- Phase 7 – Decommissioning and Borehole Abandonment (4 weeks)
- Phase 8 – Wellsite Restoration (30 days)

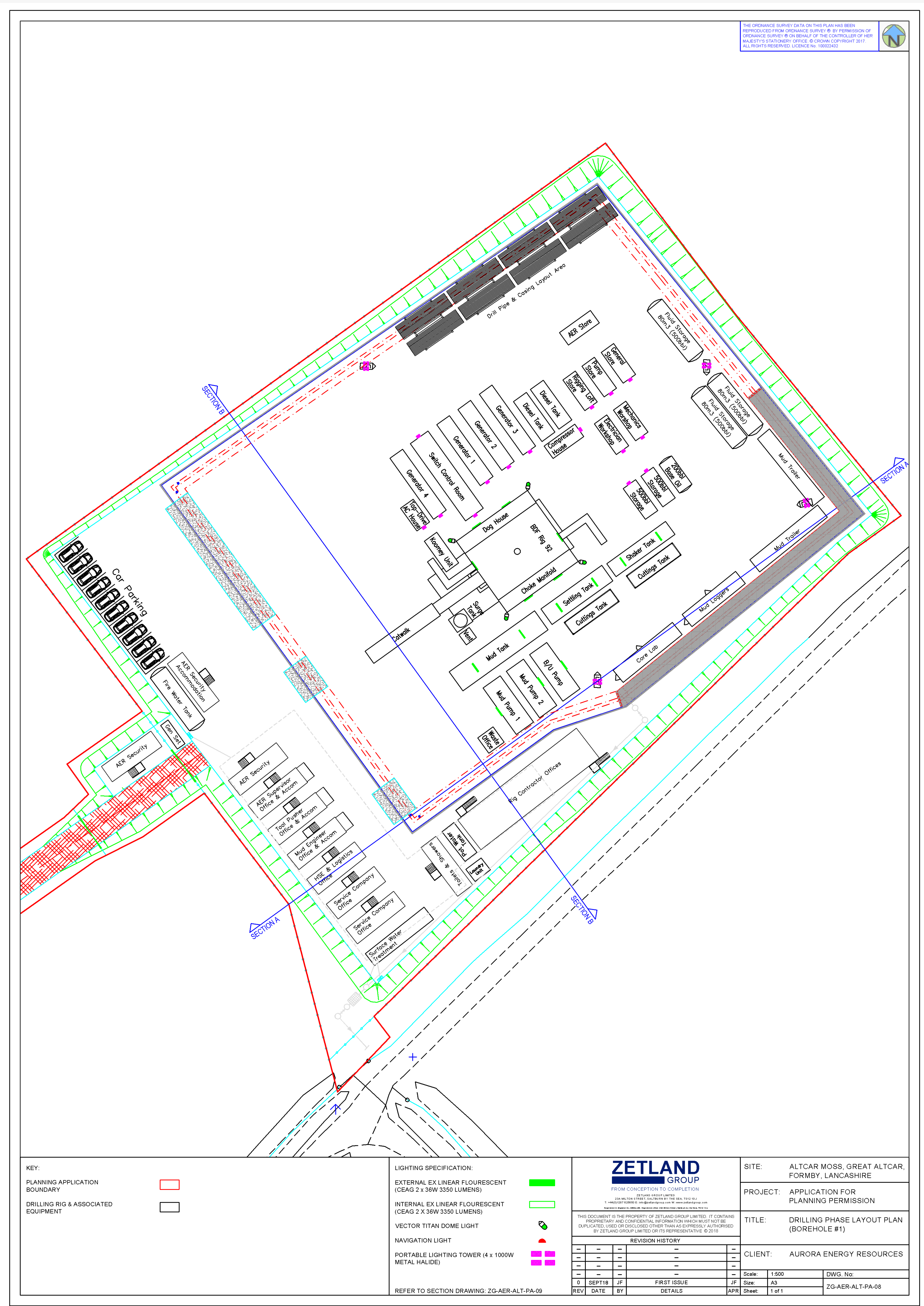
If the appraisal activities are successful, the site may be retained as a future production site with the drilling of additional production wells, installation of processing equipment and connection to the gas grid. Such development would require further planning & environmental permit consents and approval of a field development plan by the Oil & Gas Authority.



SITE LAYOUT



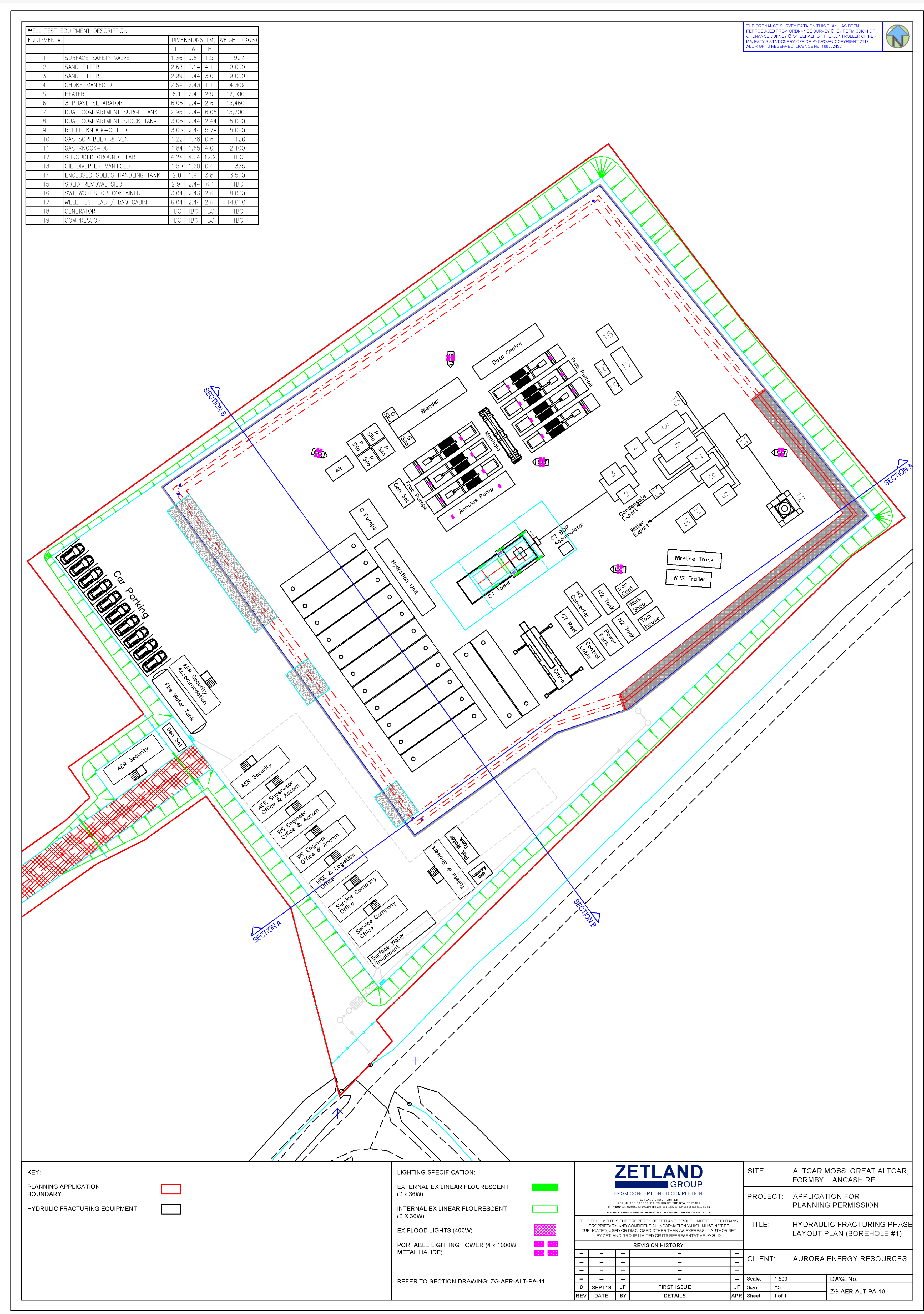
Conductor Setting Layout



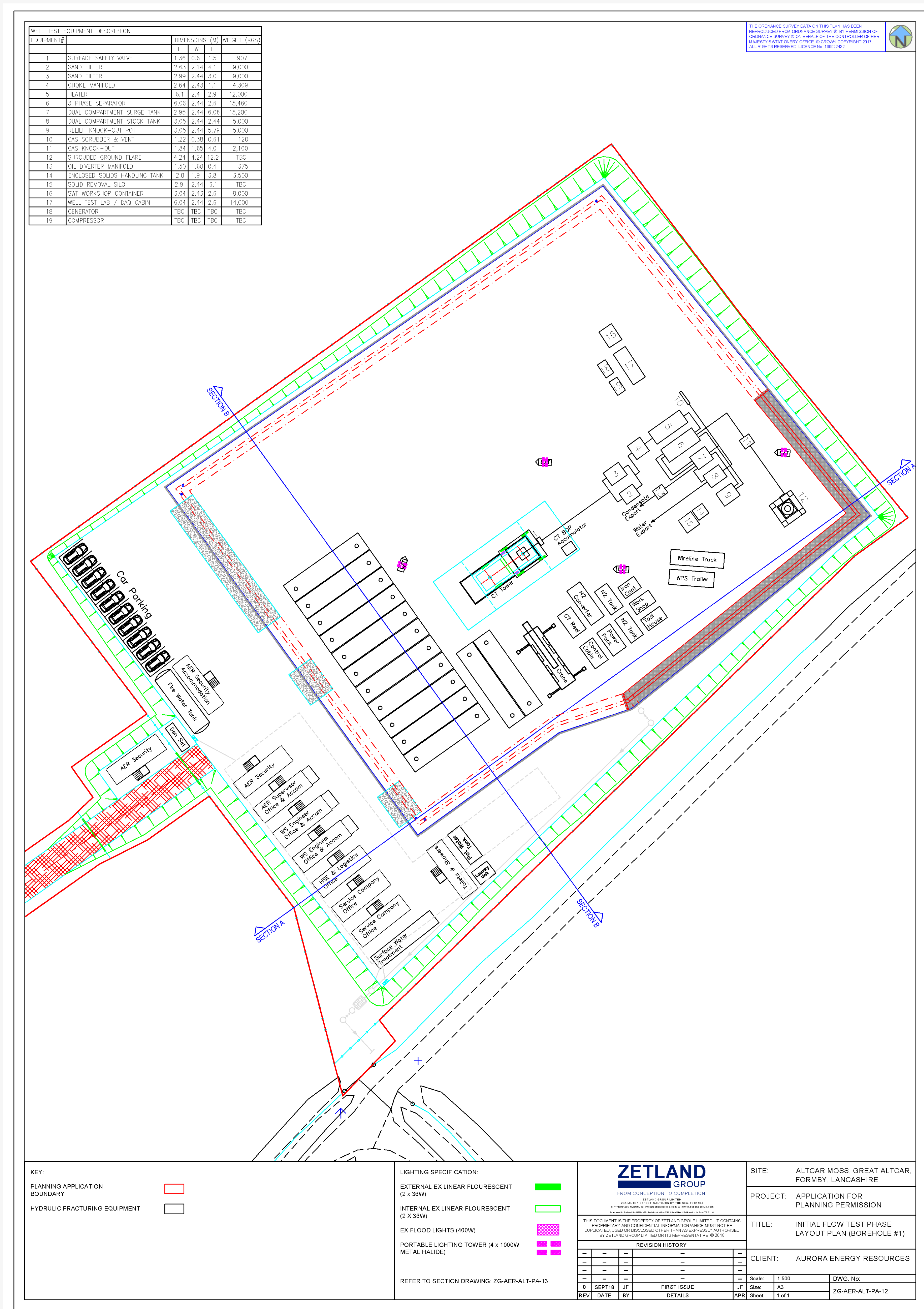
Drilling Layout



SITE LAYOUT



Hydraulic Fracture Phase Layout



Initial Flow Test Layout



HYDRAULIC FRACTURING

Once the well has been drilled it is time to complete it for flow testing or later in the project for production.

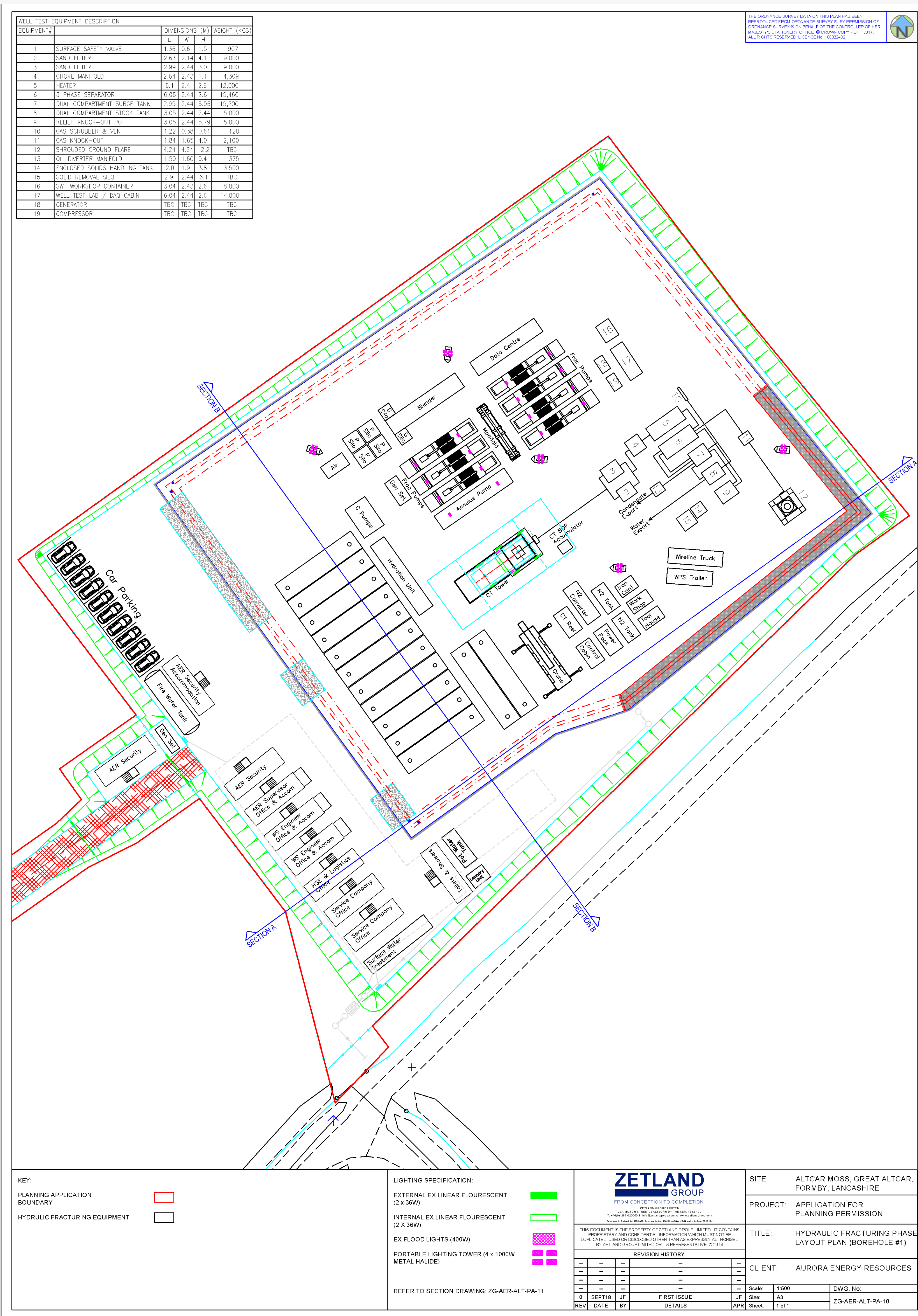
The hydrocarbons will not flow naturally from, nor can they be pumped out of, the shale rock due to the fact that the shale is naturally impermeable. Therefore hydraulic fracturing (“fracking”) is used to increase the permeability of the shale rock and allow the hydrocarbons to be produced into the wellbore.

A mixture predominantly comprising water and sand is pumped at high pressure into the well to create a network of narrow fractures. Once the pressure is removed, the fractures try to close but are held open by the

sand grains (called proppant as they prop open the fractures). The gas (and oil) can now flow around the sand grains within the fractures to the wellbore and be recovered.

In a given horizontal well or “lateral” over 30 frac stages may be run during the well completion process with each stage taking typically 2 to 4 hours

Afterwards, the equipment used during the hydraulic fracturing process is removed from the site. The hydraulic fracturing of a well represents a very small percentage of the productive life of the well which may extend over 10 years.



Given the depth at which the hydraulic fracturing takes place and the maximum height of the fractures produced, there is no risk of the fractures reaching and contaminating shallow water sources.

All components of the hydraulic fracture fluid must be approved in advance by the Environment Agency and the Oil & Gas Authority must approve the proposed Hydraulic Fracture Plan



INDUCED SEISMICITY

Unsurprisingly, there is much public interest around the possibility of hydraulic fracturing causing earthquakes. This follows a series of minor events recorded near Blackpool in 2011 during the hydraulic fracturing of a shale gas exploration well.

The hydraulic fracturing process is designed to split the shale rock and the creation of these micro-fractures can be detected by sensitive specialist equipment. On rare occasions, the fluid injected into the well may lubricate a pre-existing geological fault causing it to slip. This can produce larger seismic events which, if strong enough, may be felt at the surface.

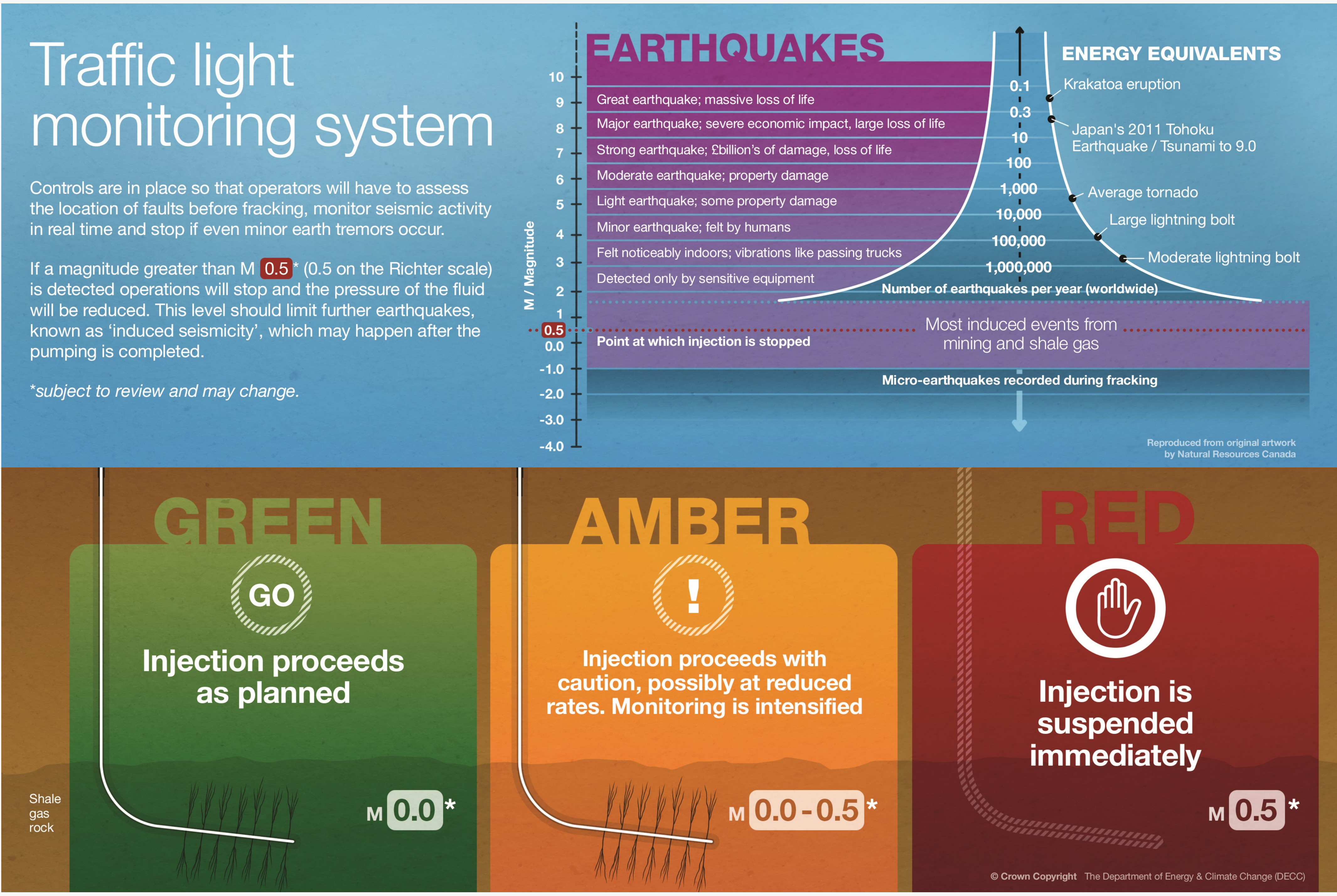
Similar induced seismic events have resulted from some mining operations, extraction of conventional oil and gas, disposal of waste water underground and even the filling of surface reservoirs behind dams for hydroelectric schemes.

The magnitude of seismic event that can be induced is a function of (i) the amount of natural stress built up

within the rock, itself a function of rock strength, and (ii) the area of the fault that slips - which in the case of hydraulic fracturing is related to the amount of the injected fluid that enters the fault.

Studies conducted in the UK for the Government and based upon a long history of coal mining-related induced seismicity have concluded that the largest possible hydraulic fracturing-related earthquake within the Bowland Shale is likely to be of magnitude ML 3.1. On a global scale this is a small event and whilst such an event may be detected at the surface it is very unlikely to result in any damage to property.

To put the above into perspective, the largest recorded natural earthquake onshore in the UK occurred in 1984 on the Llyn Peninsular with a magnitude of ML 5.4. This earthquake released ~45,000 times more energy than the largest of the Blackpool induced shale gas earthquakes (ML 2.3).



A traffic light monitoring system, as illustrated above, aimed at mitigating the impact of any induced seismic events, will be implemented at Altcar Moss. In addition, peak particle velocity (PPV) monitoring will aim to ensure that any ground vibration is below a level that could cause even minor damage to property.

During normal operations, downhole microseismic monitoring will be used to map the growth of hydraulic fractures to ensure these remain within the target zone.



WATER

The Altcar Moss site has been assessed for any likely significant effects relating to water including flood risk, impact on water resources and risks of surface or groundwater contamination.

Embedded mitigations in the proposed development and best practice in site and well construction will ensure that risks to water are minimised.

All operations at the site that may pose a risk to surface or groundwaters will be subject to a permit from the Environment Agency which will detail the monitoring required to demonstrate that water resources are protected.

A number of shallow water monitoring boreholes will be constructed at the site to measure both water quality and methane (natural gas) levels. Monitoring of surface waters will also be undertaken in adjacent drainage ditches.

The Flood Risk Assessment for the proposed site concludes that there would be no additional risk of flooding to neighbouring land or properties as a result of the proposed operations.

Flood risk has been assessed as very low provided that surface water is managed appropriately via local discharge (subject to permit) or tankering offsite depending on the project phase.

Age	Unit	Hydrogeological Unit
Holocene	Drift	
Permo-Triassic	Mercia Mudstone	
	Sherwood Sandstone	
	Manchester Marl	
	Collyhurst Sandstone	
Carboniferous	Millstone Grit	
	Upper Bowland Shale	
	Lower Bowland Shale	
	Hodder Mudstone	
	Bowland High Group	

Layer 1: Superficial Deposits above the Glacial Till

Unit contains groundwater with a resource value. Recharge to this layer is via direct infiltration of rainfall at surface and downwards percolation. This unit will be monitored using shallow boreholes and surface sampling.

Layer 2: Glacial Till and Mercia Mudstone

Unit is poorly permeable and provides a barrier to any upward movement of highly mineralised/saline formation waters from deeper layers.

Layer 3: Permo-Triassic Sandstones

Sherwood Sandstone is a Principal Aquifer when present at shallow depth e.g. at abstraction points to the East of the site. However, at the Altcar Moss the formation water is expected to be brackish to highly saline due to the depth of burial as seen on test of Formby-4 well. There is no active recharge to this layer.

Layer 4: Carboniferous Strata

Unit has limited hydraulic conductivity and limited storage. Some formations contain hydrocarbons and highly mineralised formation water with no resource value. There is no active recharge to this layer.

All water used for hydraulic fracture stimulation at the proposed Altcar Moss wells will be obtained from the public water supply. This will not result in any reduction of supply to the public.

The water used will quickly mix with saline formation waters and that portion which is not recovered as flowback fluid will remain underground in the target formation. Flowback waters will be removed offsite and disposed of at a regulated waste facility. Further information on waste disposal can be found on the exhibition board entitled Waste.

In the context of a similar development for which environmental permits have been issued, the Environment Agency have stated that they see no plausible pathway for retained fluids to migrate upwards into contact with shallow groundwaters.



NOISE AND AIR QUALITY

The noise from each phase of the proposed development has been modelled and assessed against existing noise levels in the area. Baseline measurements were taken at seven locations.

Noise levels at the nearest residential properties will be well below the levels required in planning guidance for all phases of operation.

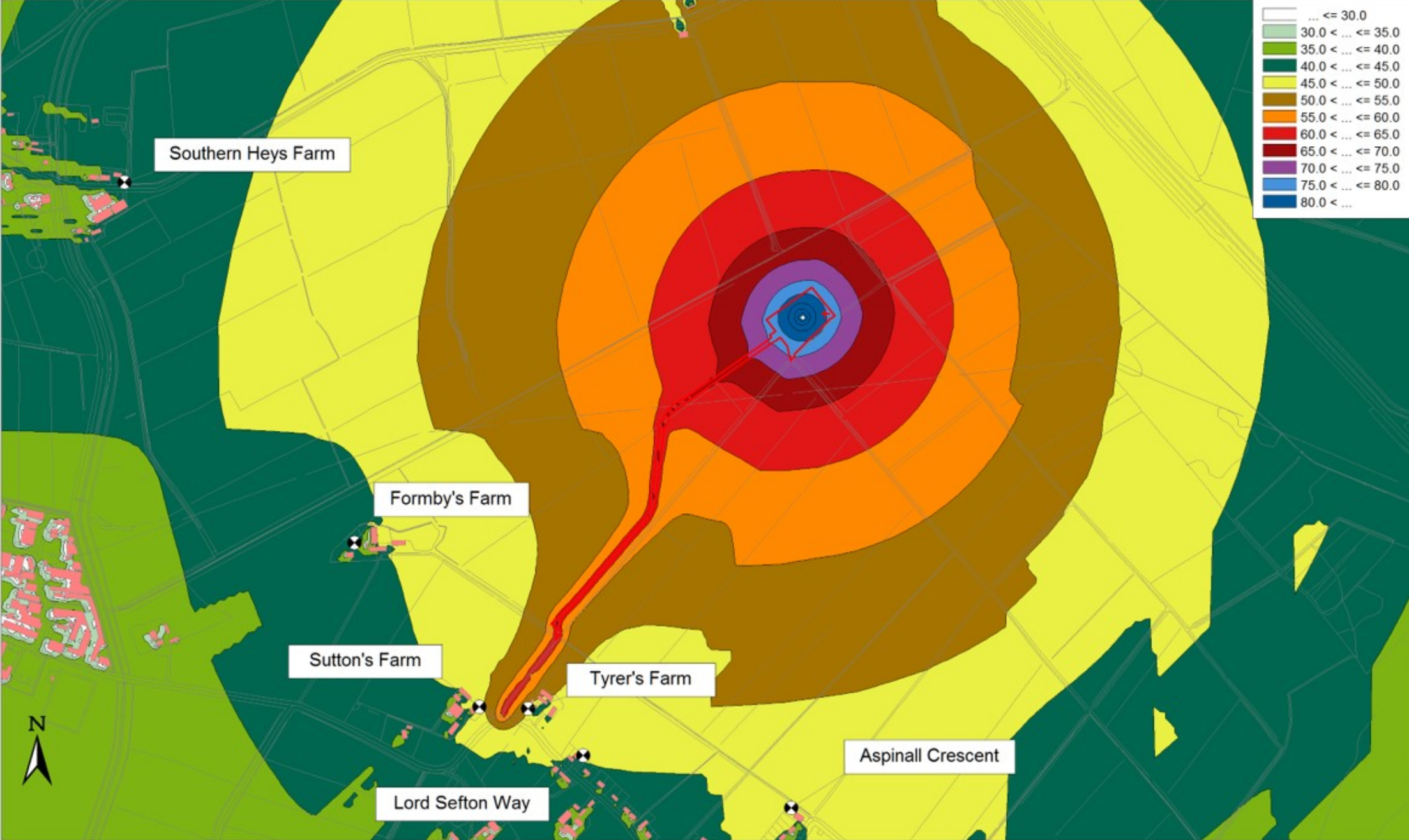
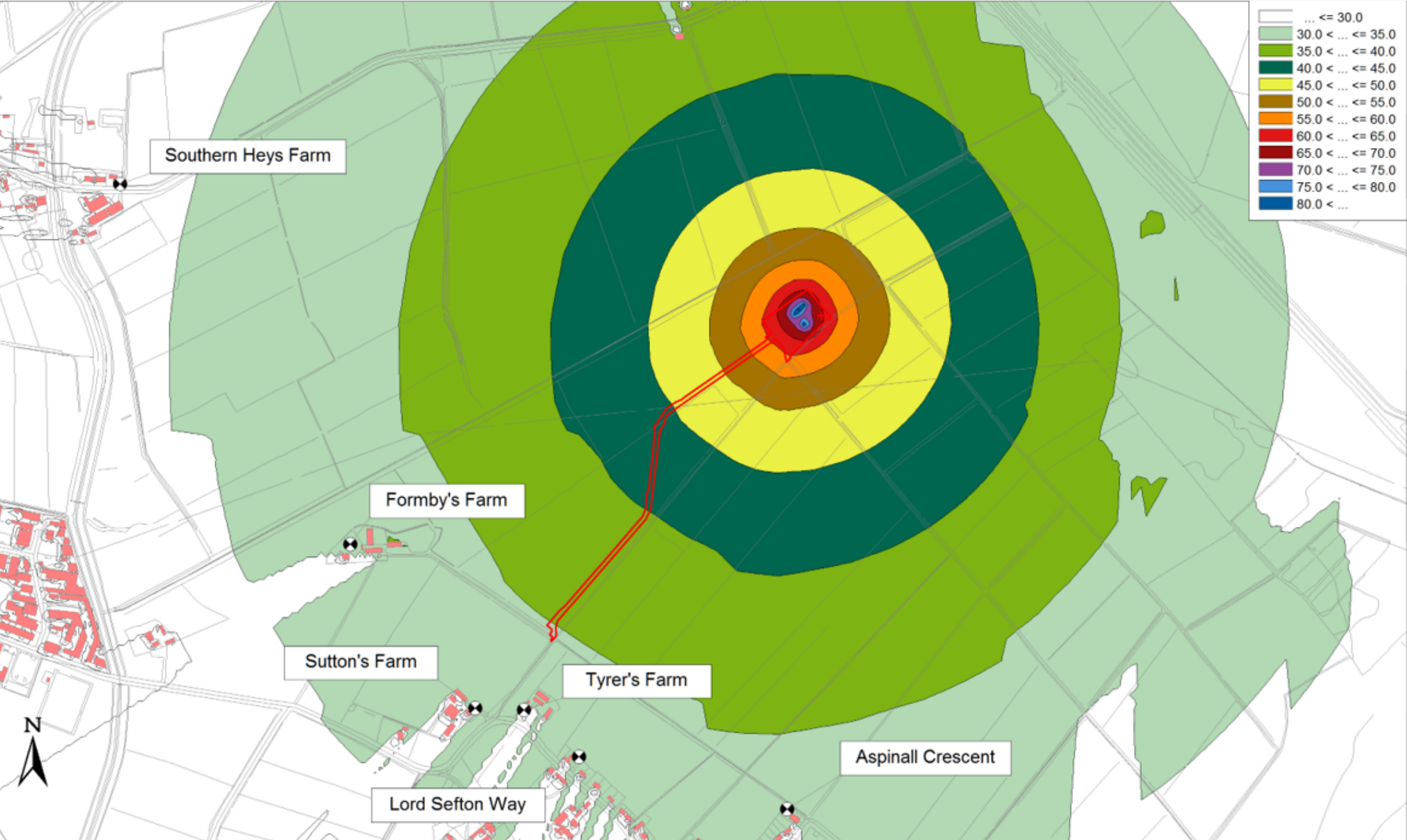
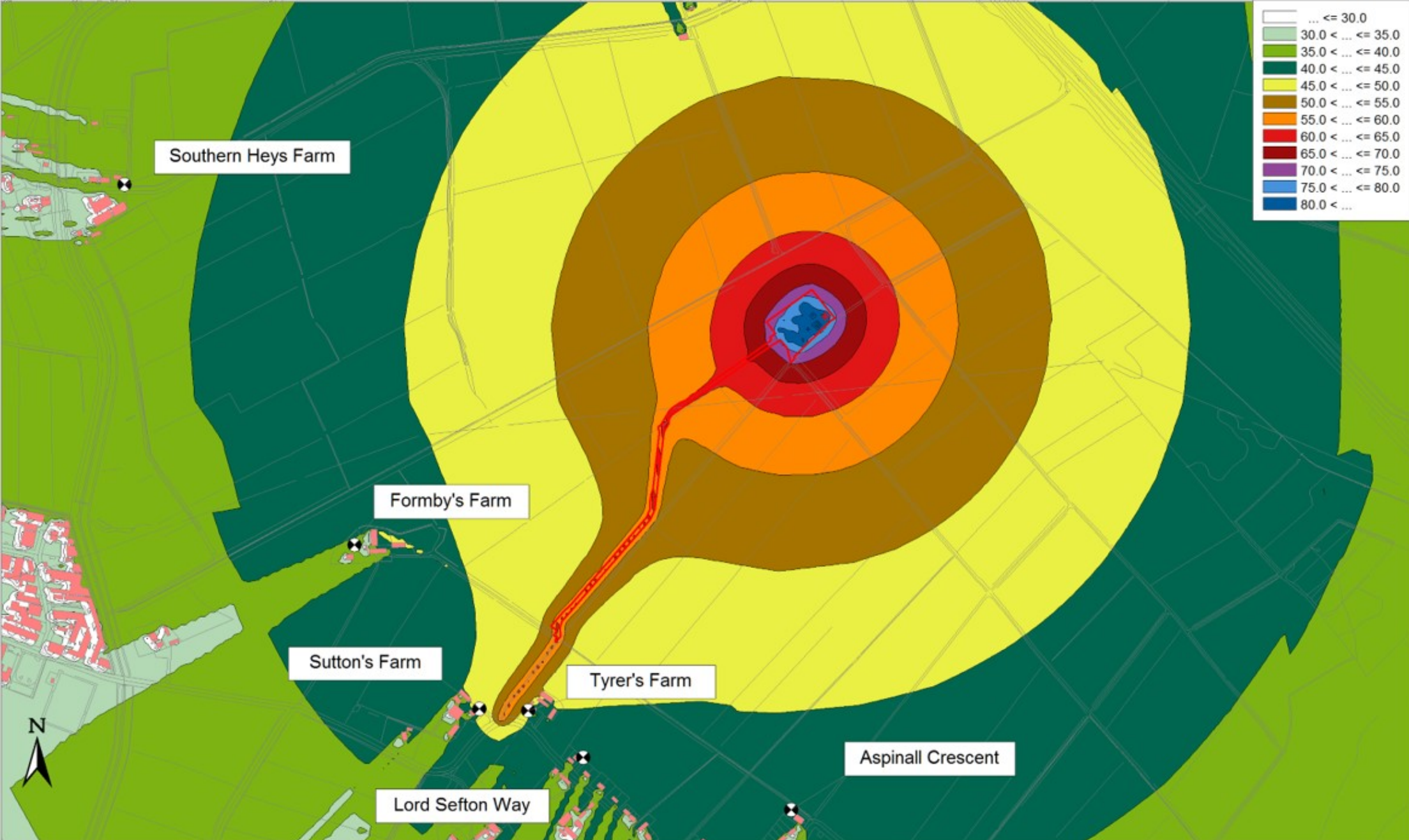
The site construction and the hydraulic fracturing phases produce the highest noise levels but this will be restricted to the daytime. Drilling and well testing (flaring) will take place 24 hours per day.

There is a small modelled increase (up to +5dB) in night-time ambient noise levels at the nearest properties to the site although the levels remain below the absolute noise level in guidance of 42 dBA.

Actual noise levels will be monitored during operations to ensure compliance with required limits.

Vibration from drilling operations has been assessed and is expected to be imperceptible at distances greater than 20 m from the rig.

Specific Sound Level (dBA) by Phase



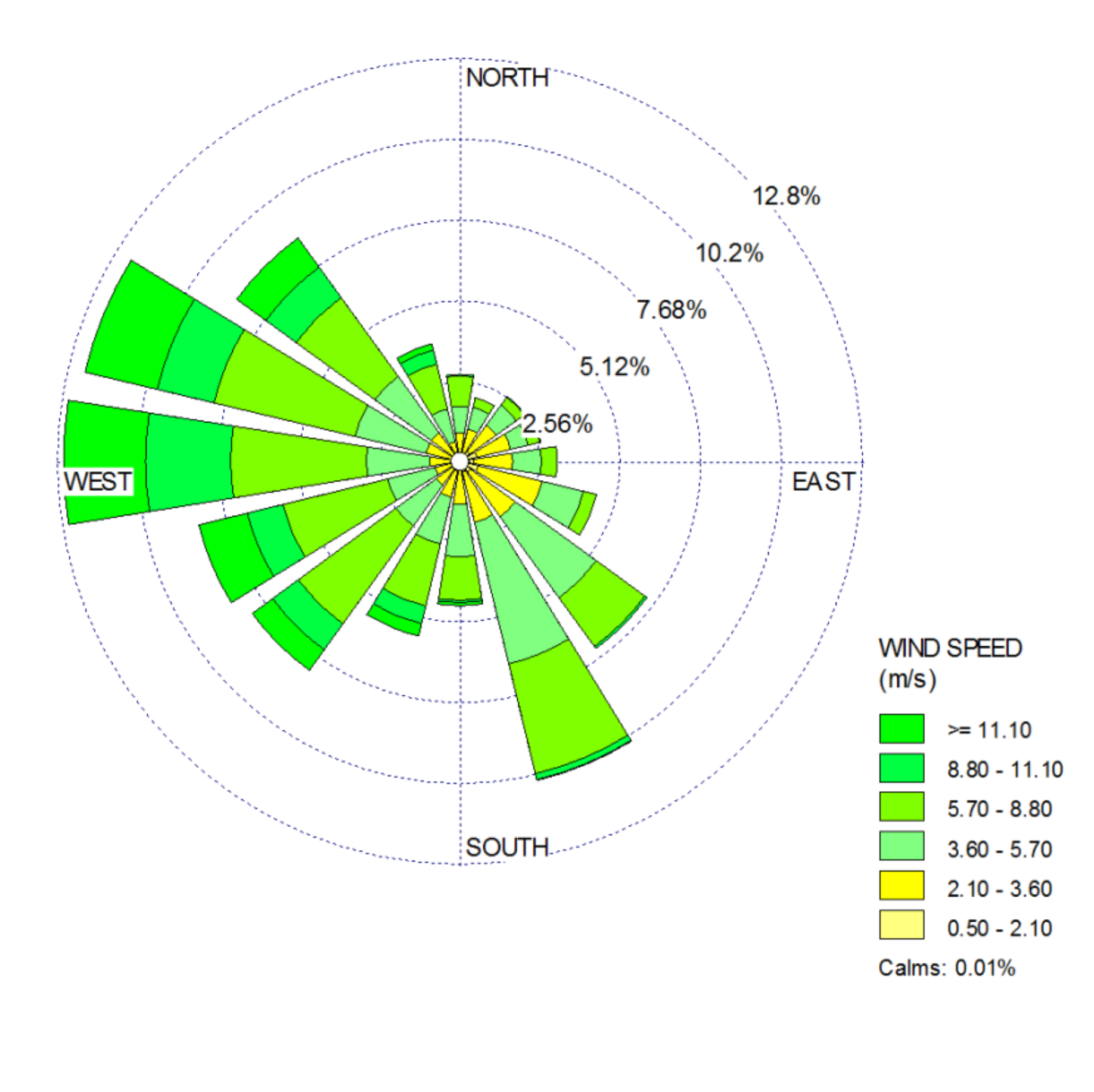
Air quality modelling of all required pollutants during all phases of the proposed development has been conducted using a numerical simulator.

The model incorporates historical meteorological data and emissions from all vehicles and plant on-site including gas flares. Over 60 model runs were conducted and the worst case for each pollutant assessed.

The potential negative air quality impact at over 40 nearby properties, and along the Cheshire Lines path has been modelled and found to be negligible.

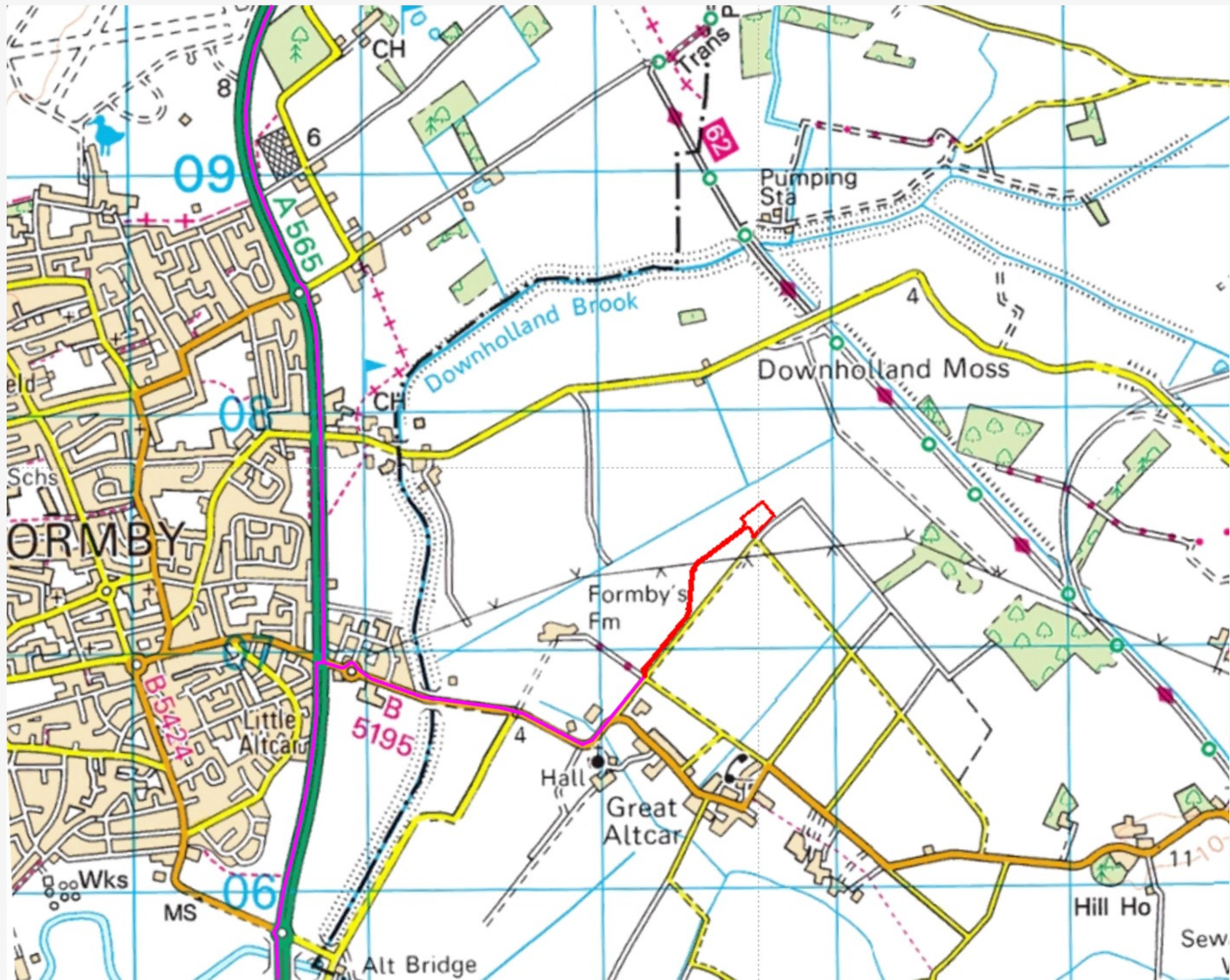
Whilst site construction operations could give rise to dust with appropriate mitigation the impact of this will be negligible.

Natural gas from any source may contain naturally-occurring radon. A radon impact assessment has been conducted looking at potential emissions of radon sourced either from flowback fluids or from gas flaring. This assessment found that releases of radon from the site are well below Environment Agency screening criteria and hence are considered not significant.



TRAFFIC AND TRANSPORT

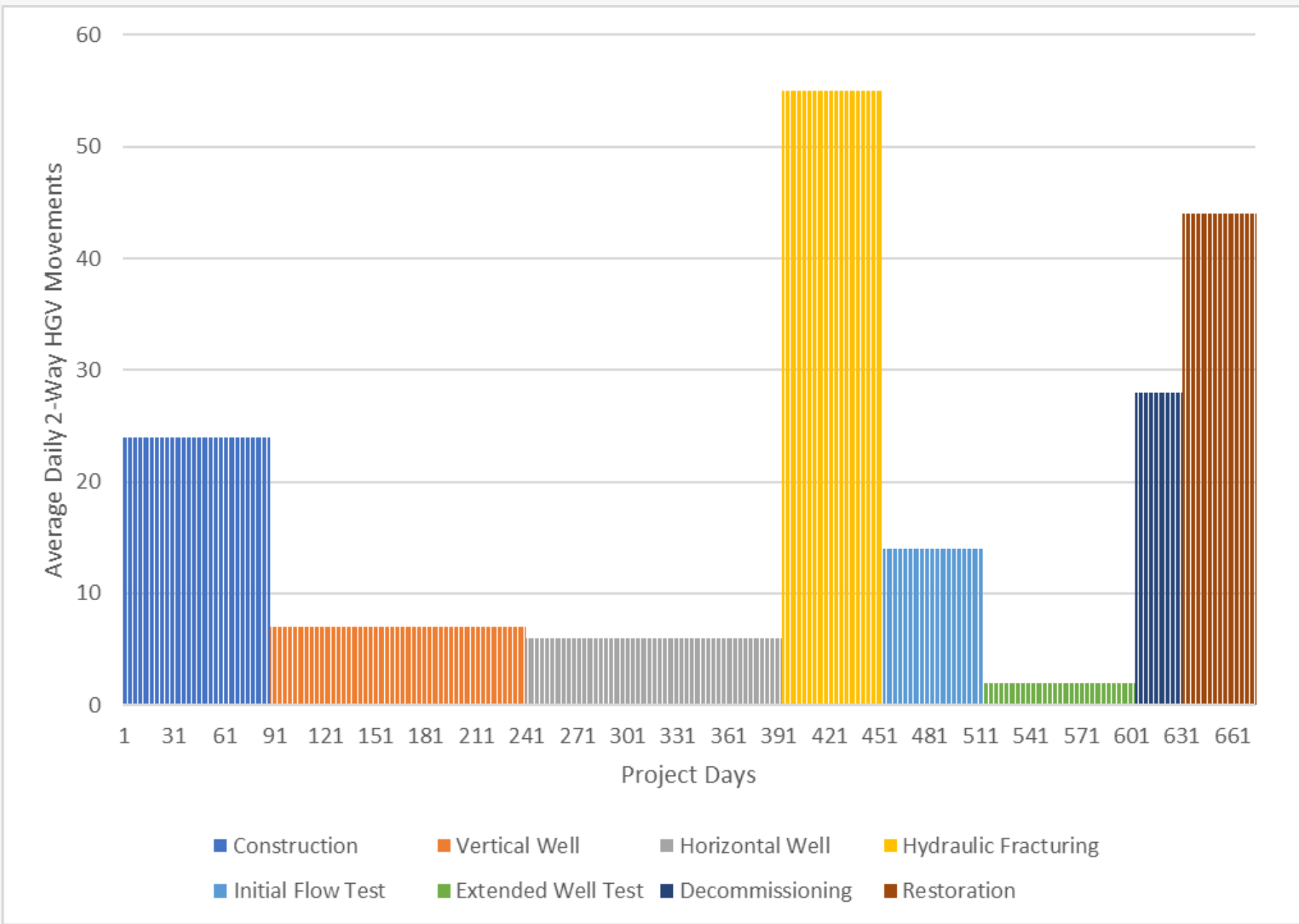
HGV site traffic will enter and leave the site via the designated route A565 (Formby Bypass) - B5159 (Altcar Rd) - B5195 (Lord Sefton Way) - Sutton Lane - Access Track



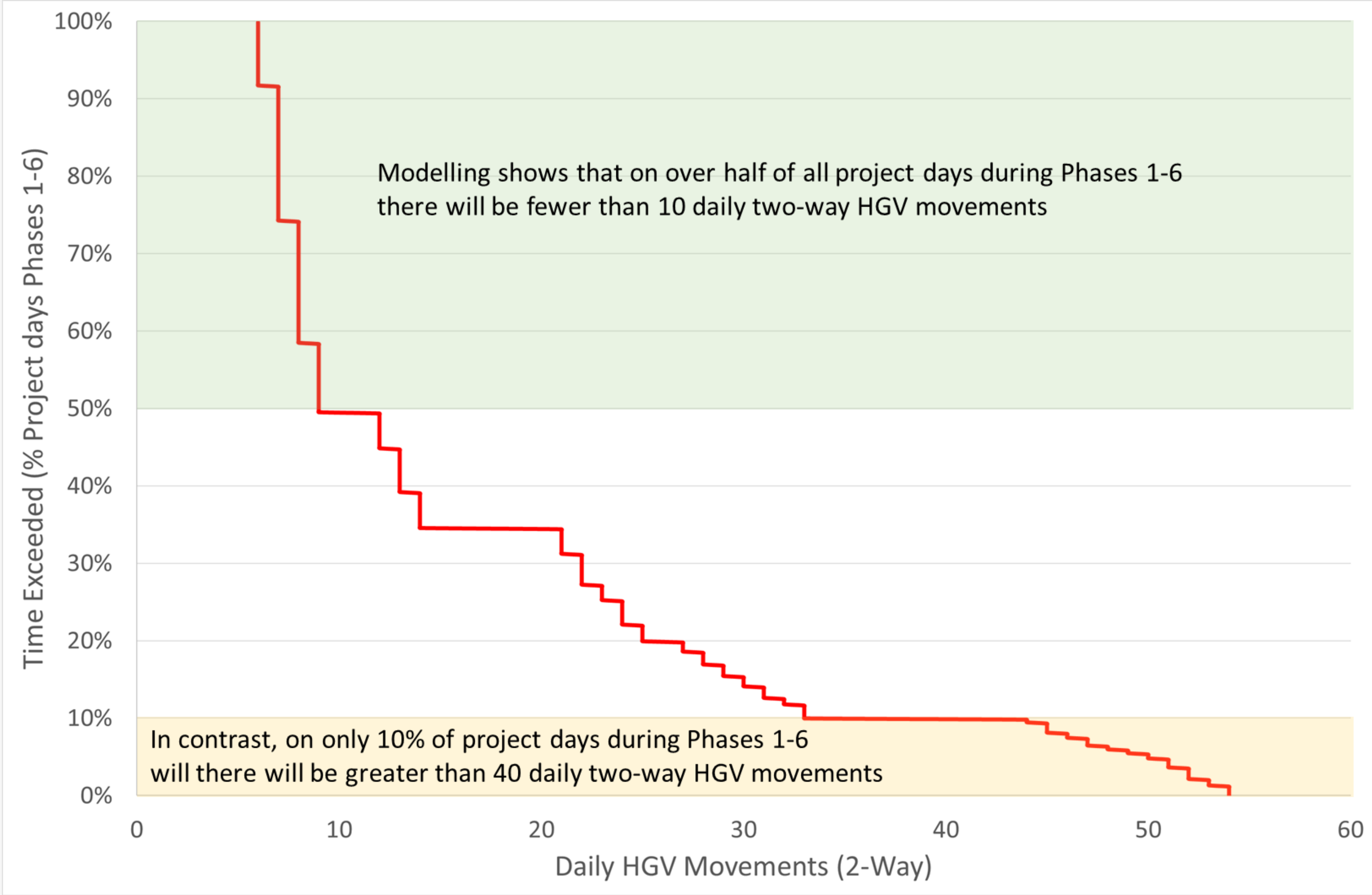
All companies making deliveries to the site will be instructed on the designated route which will be strictly enforced. Temporary signs will ensure that the access route is clearly defined for all drivers. All sub-contractors will be provided with a summary of the traffic management requirements as part of their terms of engagement.

As far as possible, deliveries to the site would be scheduled to avoid peak traffic periods.

Baseline traffic volume and speed surveys have been conducted and visibility splay requirements at the junction of Sutton's Lane and Lord Sefton Way have been reviewed. In addition, potential improvements to Sutton's Lane (to be agreed with LCC Highways) have been assessed.



The average number of daily two-way HGV movements will vary by project phase depending on the operations. The largest number of HGV movements in total will be during the construction, hydraulic fracture stimulation and restoration phases.



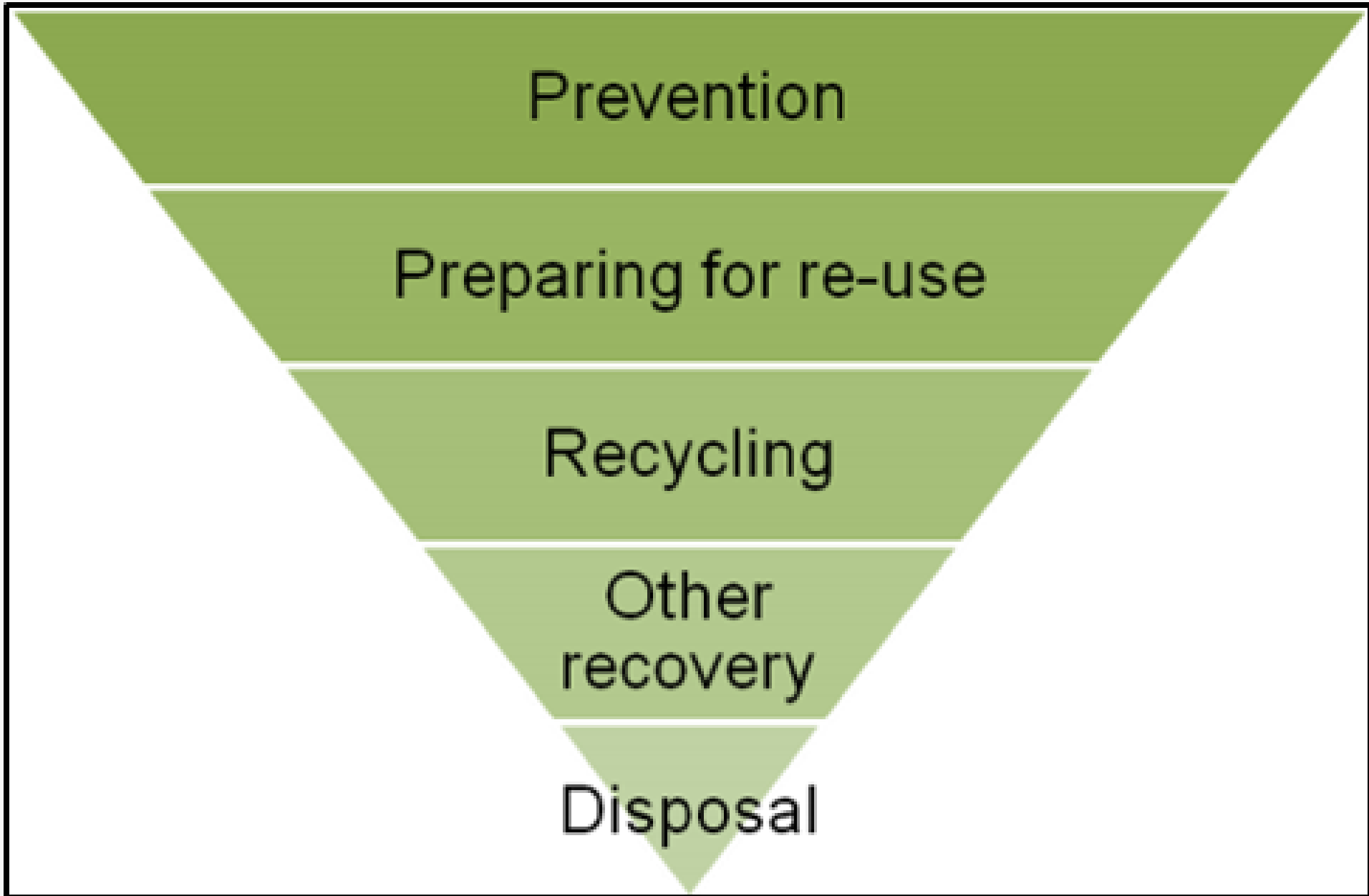
The transport and traffic assessment has found that the impact of the proposed development on severance (social impact on community), driver delay, pedestrian/cyclist delay and road safety would be not significant.



WASTE

All waste streams will be handled in accordance with the Waste Management Plan which sets out the arrangements for the management, supervision, storage, monitoring and disposal of waste during the proposed development.

The Waste Management Plan is the main document required to support a permit application to the Environment Agency under the Environmental Permitting (England and Wales) Regulations 2016.



The waste hierarchy sets out that the most preferable solution to waste is prevention, with the least preferable solution being disposal.

All waste will be sent to appropriately licensed waste treatment facilities. Where required as part of the environmental permitting process, letters from the receiving waste treatment facilities will be obtained confirming that they have the capacity to take the relevant waste streams.

Flowback waste may contain low levels of naturally-occurring radioactive material (NORM). A radioactive substances activity permit from the Environment Agency will govern how this waste is handled and stored before being transported offsite to an appropriate treatment facility.

A review of the capacity of receiving waste facilities has shown that all wastes from the proposed development, including NORM waste, can be easily accommodated by existing infrastructure.

The drilling and testing phases of the proposed operation are classed as a Non-Hazardous Mining Waste Operation under Environmental Permitting Regulations 2016 and require a Mining Waste Permit.

That portion of the hydraulic fracture fluid that does not return as flowback will mix with and become indistinguishable from the existing highly saline formation waters in the target formation where it will remain.

Notwithstanding the above, the Environment Agency requires that the rock mass containing this fluid is treated as a Non-Hazardous Mining Waste Facility which will be included under the site’s Mining Waste Permit.

Hydraulic Fracture Fluid	HDPE Membrane
Flowback Fluid	Plastic Pipes
Flowback Fluid (NORM)	Polystorm Cells
Clays and Sand	GeoGrid (Contaminated)
Proppant (Sand)	Oil-Water Separator
Oil Based Drilling Fluid	Plastic Pipes (Contaminated)
Oil Based Rock Cuttings	Fencing
Water Based Drilling Fluid	Steel Mesh
Water Based Rock Cuttings	Metal Cuttings
Well Suspension Brine	Metal Cuttings (Contaminated)
Vegetation	Stone Aggregates (Contaminated)
Hydraulic Oils	Stone Aggregates
Engine Oils and Lubricants	Concrete / Cement (Contaminated)
Wood	Geotextile Liner (Contaminated)
Oil Filters	HDPE Membrane (Contaminated)
Natural Gas	Geotextile Liner
Surface Run-Off Water	Mixed Municipal Waste
Concrete / Cement	Foul Effluent
GeoGrid	Nitrogen

Waste Streams included in the Assessment

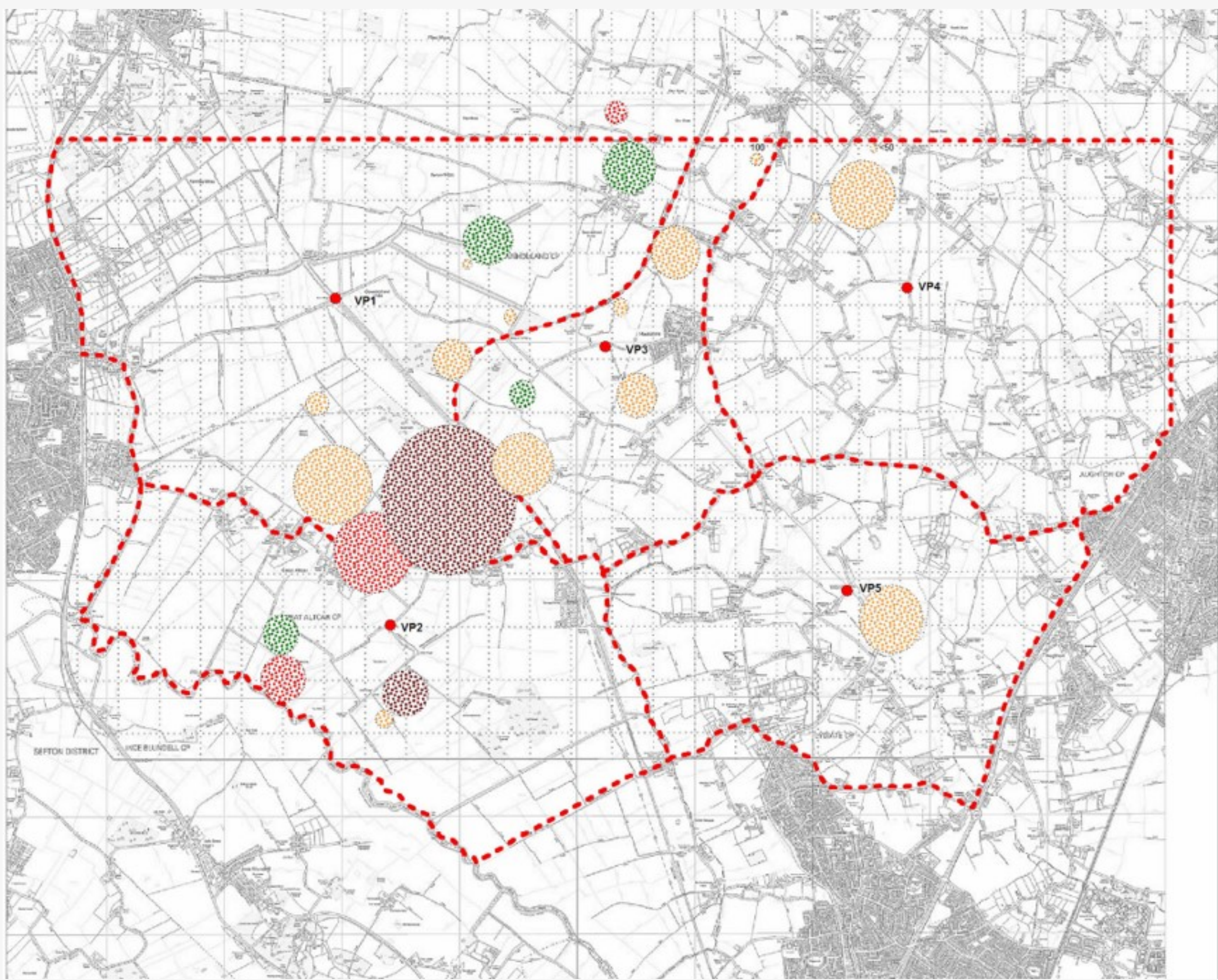


ECOLOGY

The ecological assessment has considered the potential impact of the proposed development on habitats and wildlife both within the vicinity of the site itself and at designated European sites within 10 km.

The results of a significant number of habitat and species-specific surveys conducted both for this project and in support of recent nearby projects have been utilised to inform the impact assessment. These have included habitat, bat, water vole, and both breeding and overwintering bird surveys.

The agricultural hinterland of the Ribble and Alt Estuaries Special Protection Area and Ramsar site (amounting to up to 45,000 Ha) forms important supporting habitat for overwintering geese. However, the small size of the proposed development means that its effect on this European site is considered not significant.



Overwintering Bird Vantage Point Survey

In addition to site-specific overwintering birds surveys, Aurora has conducted a wider vantage point survey which has provided a better understanding of the relationship between the agricultural environment and the likely presence of feeding pink-footed geese over the winter season.

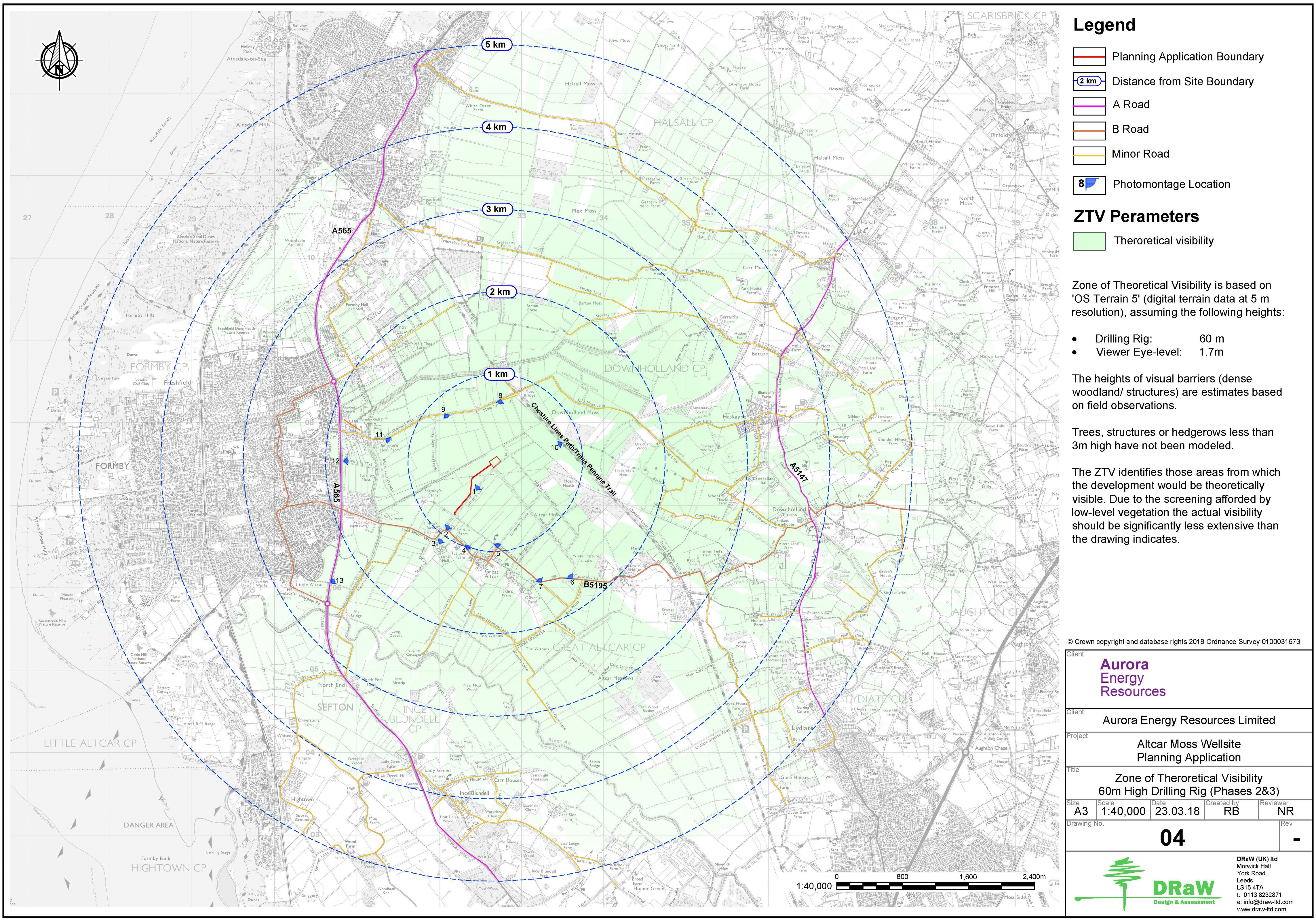
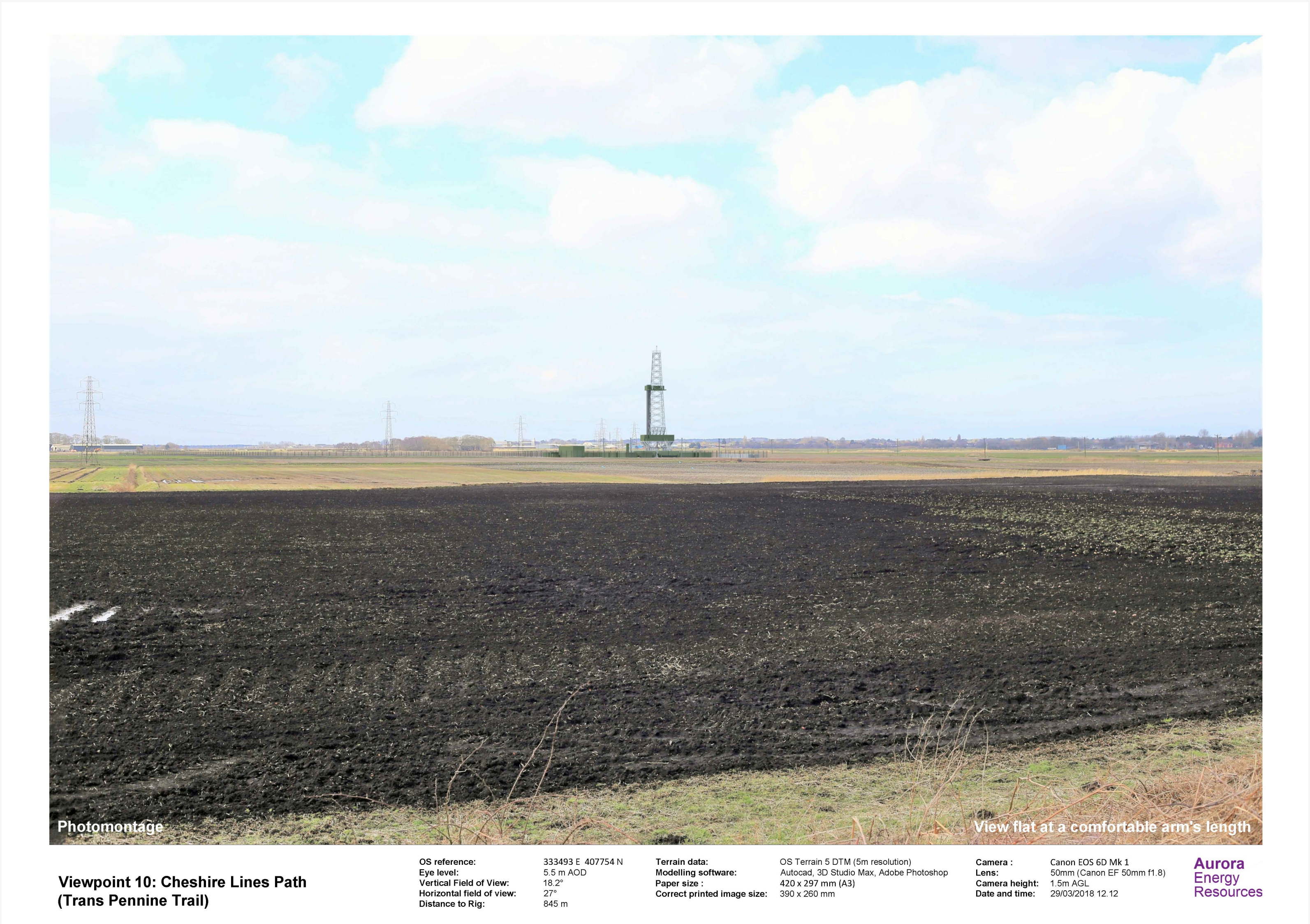


The numerous field-bounding ditches in the area support water vole which is a protected species. The proposed development has been revised to minimise the impact on water vole habitat through the addition of a separate access track. The two culverts where this track crosses the ditches will be constructed with mammal ledges to ensure that vole populations are not segregated.

Forty nine species were recorded during the breeding bird surveys, of which eight were recorded at the site itself. A single Barn Owl was the only species of bird recorded near the site which is listed on Schedule 1 of the 1981 Wildlife and Countryside Act and Marsh Harrier was the only species recorded which is listed on Annex 1 of the EC Birds Directive. The assessment concludes that the proposed site will not have a significant negative impact on breeding or protected birds.



VISUAL IMPACT



ARCHAEOLOGY AND CULTURAL
HERITAGE

The archaeological assessment has concluded that the development is not anticipated to have any negative impact on any previously identified archaeological asset.

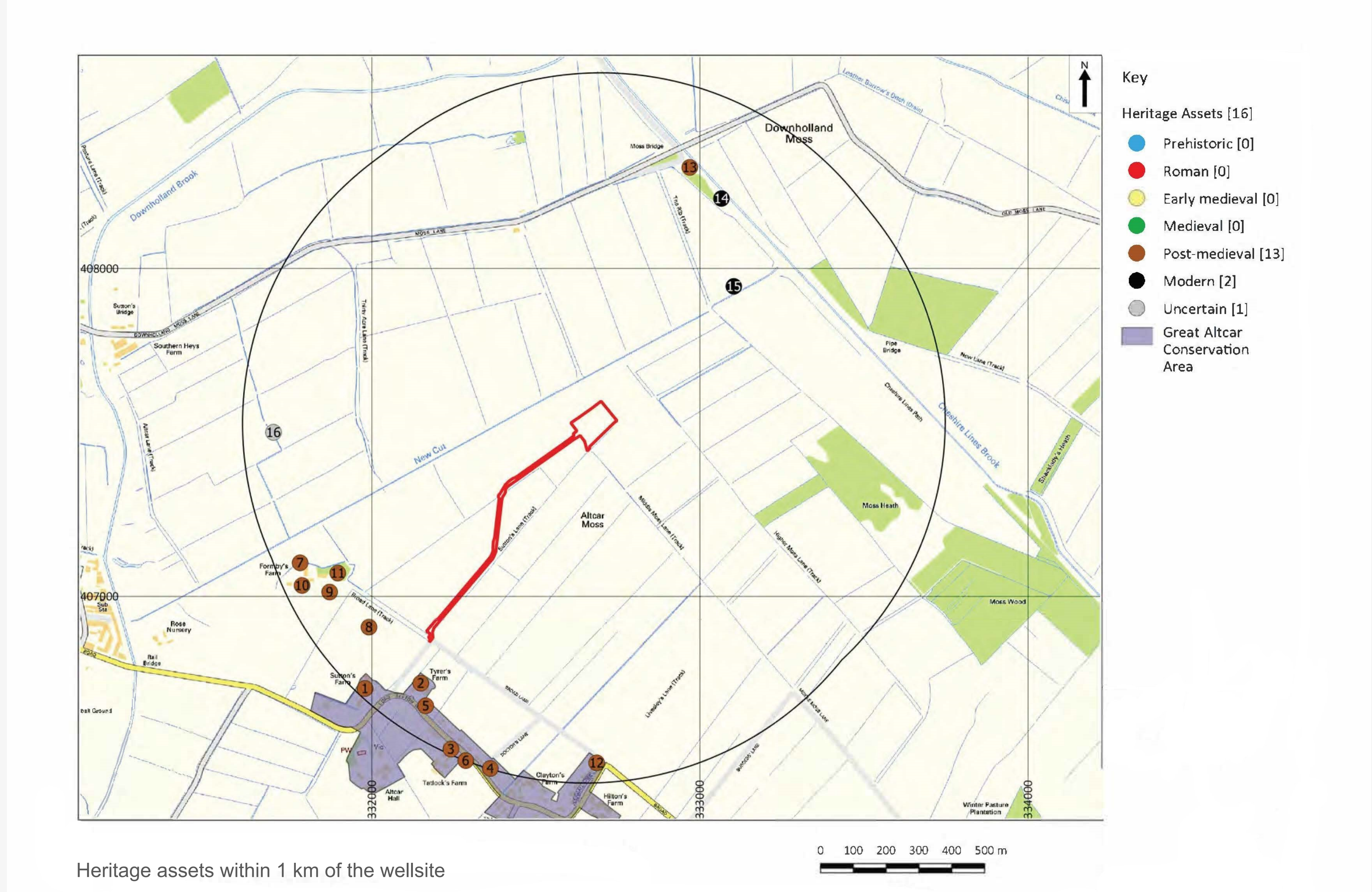
The potential for finding previously unrecorded archaeological remains on the proposed site is considered to be low. However, the wider area has produced significant finds from the Mesolithic period including the famous Formby footprints and the remains of a Mesolithic settlement at Lunt Meadows. Efforts will be made to preserve any finds identified during the limited excavations associated with the construction of the wellsite.

Most later archaeological and heritage finds are expected to be found within the bounds of the existing settlements e.g. Great Altcar, which are thought to stem from Norse settlement in the 10th Century, rather than on the mossland.

A World War II night bombing decoy site or Q Site was located approximately 500 m NE of the proposed site. The remains of a building associated with this site can still be seen. Operations at the nearby Formby oilfield were shut down on numerous occasions as an air raid precaution during this period.

30th	16	3564		24	Dark red brown Shale & grey & fawn Sst.	3500 3518	"	"	1 ½	Diamond Point	Pulled diamond point & ran core barrel.	35	2	SG. 1.16-1.136 V. 19.5 P. 15.5-22
					Light fawn soft Sst. & dark red brown Shale.	3518 3532			15 3	Core	Pulled core barrel 5% recovery.Ran DK3. Air raid shutdown 9 hours			
Detr 1st	36	3600		24	Dark brown red Shale.	3532 3540	"	"	36 14½	DK3. 9	Hole tight from 3549 with new Bit. Air raid shutdown 3½ hours.	36	-	SG. 1.151-1.152 V. 20 - 20.6 P. 23 - 31.5 Sand 2.2% Ph 8-8.5
					Dark brown red Shale.	3540 3548								
2nd	35	3635		24	Grey to white coarse Sst with beds of dark brown Shale etc	3548 3572	"	"	35 20½	DK3. 9	Air raid shutdown 2½ hours	71	-	SG. 1.155-1.162 V. 19.8 - 22.8 P. 34.5 - 45.8 Ph 8.5 - 8
					Dark brown red Shale.	3572 3612								
3rd	23	3658		24	Grey to white Sst	3612 3614			23 13½	DK3. 9	DK3.No.9-¾" undersize. New Bit held up 3565. Reaming down. Air raid shutdown 1½ hours.	94	1	SG. 1.155 - 1.174 V. 21.8 - 25.2 P. 44 -65 - 53 Added 2 cwtS Soda Ash.
					Dark brown red Shale,light brown red marl & Waly Sst etc., with a ¾" band of fawnish mottled grey limestone 3660-3664.	3614 3620								
4th	12	3670		24	CORE-3549'-3564' - 5% Dark grey coarse to Sst,hard to soft.	3620 3670	"Bitumen Specks"		12 5½	DK3C. No.8	Reamed 3595 - 3658 Air raid shutdown 1½ hours.	12	-	SG. 1.179-1.177 V. 20-19.2 P. 24.4 -19.4 Sand 5.8% Ph. 9
TOTAL	215	3670	10½	168										
RESIDENT GEOLOGISTS REMARKS					The samples are composed of varying amounts of light grey or fawn, fine to coarse, hard to soft Sandstone with "Bitumen Specks" in patches, dark red brown shale, and white massive dolomite with varying subordinate amounts of light red sandy ml to Marly sandstone, with also occasional traces of gypsum, green marl to marly sandstone to shale, greyish or fawnish or greenish highly calcareous sandstone to limestone, and very thin calcite veins. One igneous chip was noted in the sample 3608'- 3610' and very occasionally there is an odd rounded chip of black shale which might or might not be in situ. It was in order to get a control over the samples that the core 3549' - 3564' was taken but this failed as only 5% was recovered. Hence the above tabulated formation descriptions must be read as showing the dominant rock type for each depth division in a rapidly alternating series.									
SUPERINTENDENT'S REMARKS					Boulder Clay is increasing the gravity. A large saving in time is being made as work is now continuous during air raid warnings in daytime. Drilling speed has decreased to 2 ft/hour after the soft beds down to 3600'. Considerable wear is occurring on the side cutters of bits necessitating a great deal of reaming. The auxilliary pull out gear is being installed and the next deviation test will be made when this gear is commissioned.									

Formby-1 Well Weekly Report 4th Oct 1940



Since the present building of St Michael and All Angels was constructed in 1878-79, a total of five exploration wells (one brine and four oil and gas) have been drilled closer to the church than the currently proposed development.



BENEFITS OF DEVELOPMENT

UKOOG Community Benefit Scheme

£100,000 per site plus 1% of production revenues which could total £10 million from a single site.

Shale Wealth Fund

Aimed at ensuring that communities that host developments share in the benefits. 10% of shale gas tax revenues to be invested locally.

Business Rates

100% of business rates to be retained locally.

Jobs

EY estimate the development of a successful UK shale gas industry could generate 64,000 jobs.
The industry could also safeguard 100,000 jobs in the UK petrochemical industry.

Regional Development

The North West is well situated to benefit from the development of a UK shale industry.

Energy Security

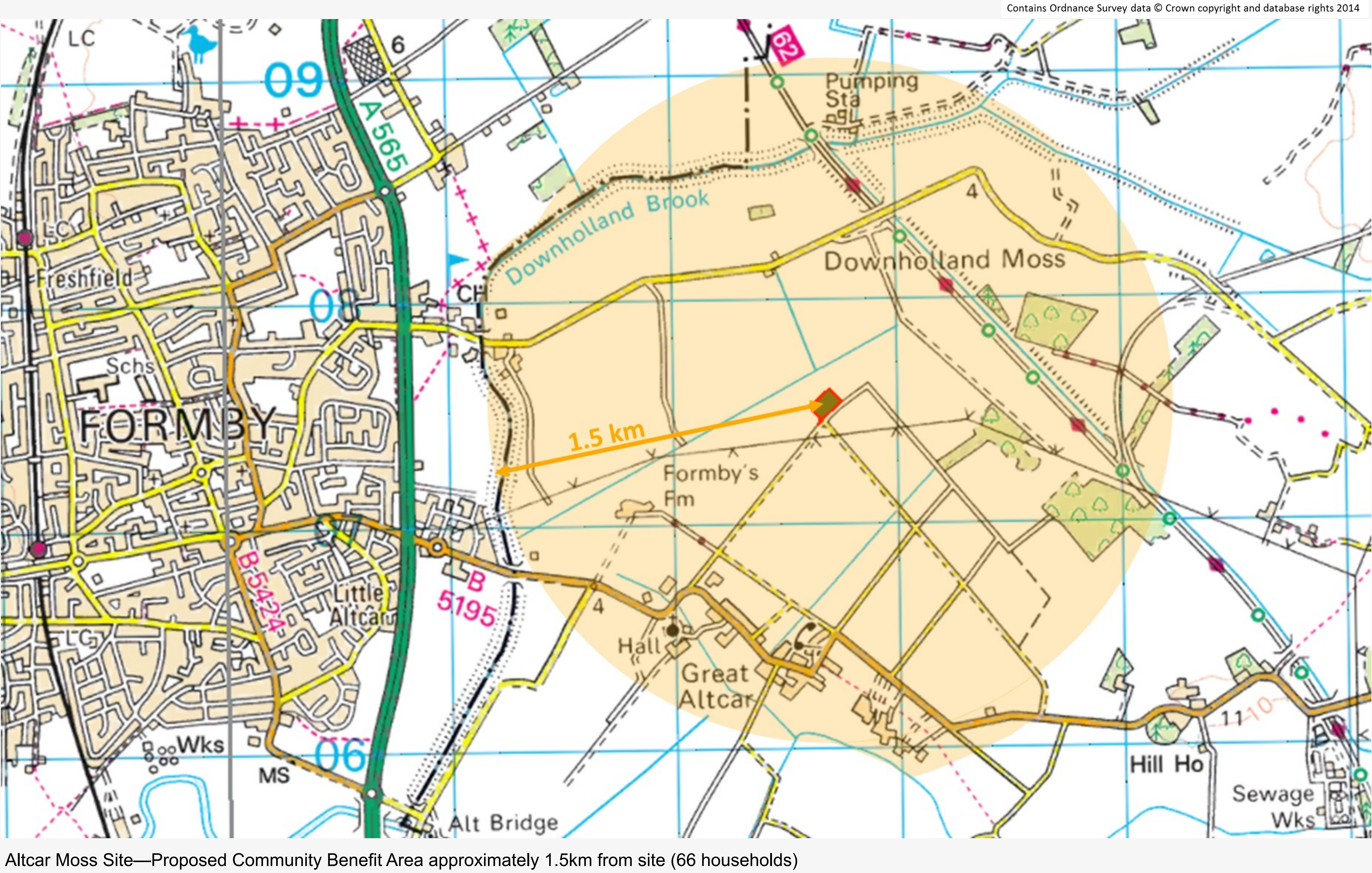
Developing our own resources reduces the UK's dependence on expensive imports.

Supply Chain Opportunities

Local businesses can grow to service this new industry.

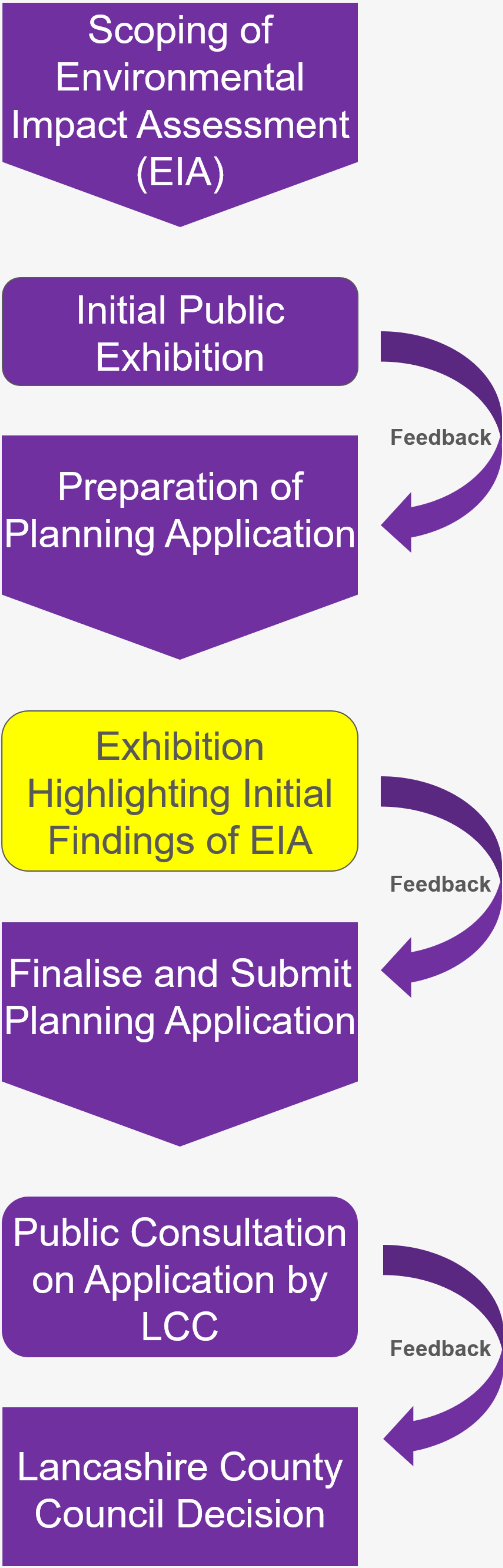
Climate Benefits

Gas produced at home is expected to have a lower carbon footprint than gas imported either via long-distance pipeline or as liquified natural gas (LNG).



NEXT STEPS

Once submitted and validated by Lancashire County Council, the full planning application will be available for public consultation.



As our plans progress, we will provide a regular residents’ newsletter, set up a community liaison group and provide a dedicated website where all relevant information on the project can be accessed.

Aurora welcome feedback on the proposed development at any time. Such feedback can be addressed to the e-mail address below.

info@altcarmoss.co.uk

0800 170 1550
(Mon-Fri 9-5:30pm)

