

Permitting decisions

Variation

We have decided to grant the variation for Preston New Road Exploration Site operated by Cuadrilla Bowland Limited.

The variation number is EPR/AB3101MW/V006.

We have also carried out an Environment Agency initiated variation to the permit.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

Purpose of this document

This decision document provides a record of the decision making process. It:

- highlights key issues in the determination
- summarises the decision making process in the decision checklist to show how all relevant factors have been taken into account
- explains why we have also made an Environment Agency initiated variation
- summarises the engagement carried out because this is a site of high public interest
- shows how we have considered the consultation responses

This is a decision document, which accompanies a variation notice.

It explains how we have considered the Applicant's application, and why we have included the specific conditions in the variation notice we have issued to the Applicant. It is our record of our decision-making process, to show how we have taken into account all relevant factors in reaching our position. Unless the document explains otherwise, we have accepted the Applicant's proposals.

Read the permitting decisions in conjunction with the variation notice. The introductory note summarises what the variation covers.

Key issues of the decision

Preliminary information

The application we received contained proposals to vary the existing permit EPR/AB3101MW issued 16/01/2015.

We gave the variation application the reference number EPR/AB3101MW/V006. We refer to the Application as “the Application” in this document for consistency.

The number we have given to the variation notice is EPR/AB3101MW/V006. We refer to the notice as “the Notice” in this document.

The Application was duly made on 08/07/2019.

Summary of the application

The Applicant updated the approved Waste Management Plan to detail the use of nitrogen lifting as an artificial lifting technique.

The Waste Management Plan has been updated to include the use of nitrogen lifting as an artificial well lifting technique, if required, as part of the well completion phase following hydraulic fracturing. Nitrogen lifting is a safe and commonly practised technique in the oil and gas industry.

The purpose of a nitrogen lift is to bring liquids (injected hydraulic fracturing fluid and formation fluids) from the borehole to the surface. The liquid can prevent natural gas flowing to the surface so may need to be removed before a well test can start.

The use of nitrogen, which is an inert gas, may result in the release of uncombusted formation natural gas (which is principally methane), known as venting. The Applicant has proposed the use of propane as a support fuel to ignite the flare and minimise the amount of gas that could be vented. The addition of propane increases the proportion of combustible gas (natural gas from the formation and propane support fuel) and to enable the gas mixture to be combusted in the flare rather than being vented.

1. Summary of our Decision

We have decided to issue the variation requested. In addition as part of our determination we have decided to vary the following conditions by way of an Environment Agency initiated variation:

- We have amended table S3.6 to add a requirement to provide continuous video monitoring of the flares while gas is being flowed to them.

To maintain clarity of the permit, the changes detailed above have been consolidated into a new version of the permit which now supersedes the permit granted 16/01/2015 and its subsequent amendments.

The Notice and consolidated Permit include conditions taken from our standard Environmental Permit template including the relevant Annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations, Mining Waste Directive, Industrial Emissions Directive, Groundwater Directive, Water Framework Directive and other relevant legislation.

This document does not therefore include an explanation for these standard conditions. Where they are included in the Notice and consolidated permit, we have considered the Application and accepted that the details are sufficient and satisfactory to make the standard conditions appropriate.

We have tried to explain our decisions as accurately, comprehensively and as plainly as possible, although given the nature of the Application it is inevitable that this document contains a significant amount of technical and specialist language.

2. How we took our decision

The Application was duly made on 08/07/19. This means that we considered it was in the correct form and contained sufficient information for us to begin our determination.

We carried out consultation on the Application taking into account the Environmental Permitting (England and Wales) Regulations 2016 and our statutory Public Participation Statement. We publicised the Application by a notice placed on our website, which contained all the information required by the Regulations, including telling people where and when they could see a copy of the Application.

We also contacted local MPs, local authorities and Parish Councils to notify them of the consultation. We also issued a press release to Lancashire media on 16/07/2019.

The Application was available online on the Environment Agency's Citizen Space website from 16/07/2019 to 13/08/2019. We placed a paper copy of the Application and all other documents relevant to our determination on our Public Register.

The Environment Agency, Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT

Anyone wishing to see these documents could do so and arrange for copies to be made.

We sent copies of the Application to the following bodies, including those with whom we have "Working Together Agreements":

- Local Planning Authority, Lancashire County Council
- Mineral Planning Authority, Lancashire County Council
- Health and Safety Executive
- Public Health England
- Director of Public Health

These are bodies whose expertise, democratic accountability and/or local knowledge make it appropriate for us to seek their views directly.

Although the application contained sufficient information for us to begin our determination we asked the Applicant to provide additional information.

Further details, along with a summary of consultation comments and our response to the representations we received, can be found in Annex 1 to this Decision Document. We have carefully considered all representations and have taken into account any relevant points in reaching our determination.

3. Description of the changes to the Permit

3.1 Changes requested by the Applicant

3.1.1 Update the Waste Management Plan to add the use of nitrogen lifting as an artificial lifting technique:

The Applicant has requested this change to allow them to use nitrogen gas to provide artificial lift within the well to assist with the removal of flowback fluid. Due to the exploratory nature of the activities at the Preston New Road site, there are some uncertainties about the pressure of the gas in the formation and its volume. Therefore it is not possible to predict whether the well will be able to flow unassisted and the use of nitrogen to lift the well is a contingency in the event that there is not enough pressure from gas in the formation to lift liquid from the well unassisted.

The use of nitrogen as an artificial lifting technique may result in the release of uncombusted natural gas through the flares. The aim of the nitrogen lift is to get to the point where the quantity of natural gas present becomes sufficient to flow to the surface unassisted. As the proportion of natural gas increases, the gas mixture will become more flammable and as it goes through the flare it will be combusted. The Applicant has proposed the use of propane as a support fuel to minimise the amount of venting where the nitrogen lift technique has been used.

Where appropriate, propane will be used to increase the proportion of combustible gas (natural gas from the formation and propane support fuel) and bring forward the point where the gas mixture will ignite in the flare rather than being potentially vented to atmosphere.

The Operator will monitor gas concentrations in all returning well fluids being directed to the flare. Once methane concentrations reach 20%v/v, the Operator will undertake a supported ignition test (using propane as a support fuel). If ignition is not achieved after five minutes, the Operator will stop the addition of support fuel to prevent the release of unburnt propane. If this is the case, the Operator will continue to monitor the concentration of methane in the returning well fluids and repeat the supported ignition tests at each methane 5% increment above 20% v/v until ignition is successfully achieved. Ignition is anticipated to be possible when methane concentrations reach approximately 30% to 50% v/v.

The Operator has provided an Operating Technique (Instruction 12 – N2 Lift Instruction V3) which details the procedures for the nitrogen lift and the ignition test and this has been incorporated in the permit in table S1.2 Operating Techniques.

3.2 Review of Best Available Techniques Assessment:

As the use of nitrogen as an artificial lifting technique may result in the release of uncombusted natural gas, the Applicant has submitted a detailed review of Best Available Techniques to artificially lift a horizontal well.

The two main compounds of concern in the natural gas are methane, which is a potent greenhouse gas and benzene, which has potential health impacts and subject to Environmental Standard.

As part of our review of the BAT assessment, the Operator confirmed that they intend to carry out the nitrogen lift for a maximum of a total of 30 days, In light of this information, we asked the Operator to review mechanical techniques assessed in section 7.0 of the BAT assessment of Artificial Lift Techniques, or any other available techniques, to determine if one of these should now be assessed as BAT taking account of waste gas management aspects.

The Operator confirmed that the time period during which venting may occur cannot be accurately predicted at this stage of exploration, however venting will not occur for more than 1 month of the year and this is considered to be a conservative scenario.

This assumption is consistent with the Operator's Air Quality emissions report which states that Nitrogen lifting will not occur for more than 1 month. The calculations presented in the emissions report are based on this conservative assumption. The Operator based the 1 month time period on a maximum anticipated duration to achieve the desired objective of well clean up and progression to a well test.

The mechanical techniques discussed in the BAT assessment were screened out by the Operator as 'not available' due to design and safety restrictions. The evaluation of these techniques has not changed: they remain 'not available' for the reasons set out in the BAT assessment and in addition are incompatible with the well test completion size.

As part of the BAT assessment, the Operator has considered whether alternative mechanical techniques or alternative gas lifting techniques could be used.

3.2.1 Mechanical techniques:

3.2.1.1 Swabbing

Swabbing involves lifting the content of the well by reducing pressure within the well by pulling wireline tools or rubber-cupped seals upwards from the well's base. This technique however is better suited to vertical or near-vertical well sections and therefore is not primarily suited for use as a lifting technique in the extended lateral well sections (i.e. the wireline is poorly suited within deviated wellbore sections) at the Preston New Road site.

The objective of swabbing is to reduce bottomhole pressure and create an underbalanced pressure to allow fluids to enter into the well. A sudden drop in hydrostatic pressure can result in a large ingress of formation fluid which induces a kick scenario (sudden influx of formation pressure) which can be unpredictable. The process of inducing kicks into the well with equipment at surface being pulled out of the hole will increase the safety risk to site operatives working near the wellhead at the

same time. The returning gas will be vented to safely control the kick pressure. A further constraint of this techniques is that it can induce sand from the formation into the wellbore which can both reduce well productivity and cause additional well operation and maintenance problems. For this reason, this technique is not considered by the Operator to be BAT for Preston New Road on account of safety concerns, risk of compromising well productivity and its potential lack of achieving a successful lift in a lateral well.

3.2.1.2 Downhole pump

This technique involves the installation of a pump (typically electrically powered from the surface) mechanism at the base of the wellbore to mechanically lift fluids within the wellbore to surface. The use of such a pump allows the intermittent or continuous pumping of bottomhole fluids in order to reduce bottomhole pressure and thereby encourage the inflow of formation fluids, including natural gas, from the surrounding formation.

Downhole pumping can be used in either vertical, or less effectively, in horizontal well sections. However, the installation of a downhole pump requires consideration during well design, and cannot be installed retrospectively. Downhole pumping is principally used as long term technique in production scenarios rather than during exploration activities, as at Preston New Road. A further limitation of using downhole pumping in the context of the Preston New Road site is that the presence of sand (or similar solids) can cause operational difficulties (such as clogging and abrasion) for mechanical (and similar) pump types, and present an increased risk of malfunction or failure. Such malfunctions typically require additional downhole interventions (with a corresponding increase in surface facilities and environmental impacts) to rectify. As the injection of large quantities of sand are integral to the planned operations at the site, the Operator considers the use of mechanical (and similar) downhole pumping techniques are not BAT for the proposed operations at this site.

3.2.1.3 Rod pumping

Rod pumping is a technique used in a number of industries including the water industry. Rod pumping units, use an up and down reciprocating motion containing a string of sucker rods to pump water to the surface. Rod pumping can be used in either vertical, or less effectively for horizontal well sections.

Rod pumping has disadvantages for horizontal gas wells; for example the effects of gas interference resulting in gas displacing fluid entering the pump resulting in less than optimal stroke performance. Furthermore, gas interference may damage the rod system when the pump travels faster than liquid in the pump barrel. In addition to these disadvantages rod pumping is not compatible for this well configuration or stage of well completion. Rod pumping is principally used for long term production rather than short term unloading of liquid to allow natural formation pressure to self-sustain flow. As this technique is not applicable to this phase of operation, well design or well objective the Operator does not consider this technique is BAT.

3.2.2 Gas lifting techniques:

3.2.2.1 Compressed natural gas (CNG) or liquid natural gas (LNG).

Lighter than air both CNG and LNG will provide good buoyancy to lift the liquids. The nature of compressibility and its temperature changes are also predictable. The mixing of natural gas with formation gas means that they will return to the surface in the form of a gas mixture which will be combusted at the flare.

Whilst the properties of CNG and LNG could achieve a liquid lift in principle, the wider safety implications of their use must be considered. The UK health and safety regulatory regime requires that all safety risks are reduced in line with the ALARP principle. The exploration site and wellbore are designed and constructed for natural gas to flow to the surface via production tubing. It is not designed to inject a combustible and explosive gas down the annulus or circulating system. The Operator has carried out a short term gas lift risk assessment involving the use of a combustible and explosive material and a safety risk assessment of using combustible and explosive gases in an

artificial lift system. Considerable redesign of the wellhead configuration, gas lift valves (emergency shut down systems, backpressure valves, and check valves) and wellbore design would be required to manage the risk of injecting a combustible and explosive gas.

Having explored options from major UK suppliers the rental availability of CNG and LNG is considerably limited in comparison to off the shelf liquefied nitrogen. CNG can be compressed to levels up to 230 barg however when unloaded directly from the transport vessel the pressure of the compressed natural gas reduces significantly when transferred. As a result a standard delivery of CNG would only operate at the upper pressure rate approx. 15m³ and then substantial reduce as unloaded. Therefore to store CNG at the required wellhead pressure would require substantial on site storage of compressed natural gas increasing the risk profile of the site. LNG is delivered at low pressure and transferred to tank storage at site.

To pressurise LNG and CNG to well head pressure (200 barg) a natural gas convertor/compressor will be required, which from market review (with a major contractor and supplier) of rental convertors/compressors are not available in the UK or Europe for short term application e.g. a gas lift.

Therefore CNG and LNG are not considered by the operator to be available techniques due to (i) the lack of a market for short term high pressure compressors and convertors and (ii) the inferior safety considerations compared to nitrogen gas.

3.2.2.2 Carbon dioxide

Carbon dioxide is a complex gas to manage with a requirement to use specialist equipment. Lighter than air, carbon dioxide provides a good source of buoyancy to lift fluids and as a non-flammable substance provides safety advantages. However pumping carbon dioxide downhole can cause corrosion of casing reducing wellbore integrity as well as compressor leaks at the surface causing fugitive emissions. Carbon dioxide can be pumped in liquefied form but will need to remain under pressure due to the risk of carbon dioxide solid ice formation causing blockage in lines and the wellbore.

Another disadvantage of carbon dioxide is that when pumped at pressure as a gas, carbon dioxide tends to start vaporizing at 900 to 1000 psig and therefore cannot lift the fluid. The wellhead pressure at Preston New Road is approximately 3000psig, the vapourisation of the gas adds an additional complication to using carbon dioxide as a lift gas. As a consequence carbon dioxide lifts is an inferior option due to:

- Corrosion risk which will elevate the risk of compromising well integrity and surface equipment due to carbon dioxide mixing with downhole liquids forming acidic well fluids;
- Compromised ability to pump high pressure gas and ability to unload a well (due to vapourisation at comparatively low pressure);
- Potential for leaks of carbon dioxide at surface from compressor stations, loading and unloading procedures; and
- The need to maintain pressure of liquefied carbon dioxide within a narrow margin in order to avoid causing solid ice blocks in lines and wellbore creating pressure points and preventing flow of fluids.

With the significant disadvantages compared to other gases, carbon dioxide is not considered by the Operator to be a technically viable option and is therefore not an available technique.

3.2.2.3 Air lifting

Air lifting was established in the 1920s but has now been largely replaced by alternative gas options that have become more widely available. Alternative gases, which are lighter than air, provide a superior performance and lessen the fire and explosion hazards to people and the surface equipment and to well integrity if an explosion occurs within the wellbore created by air when exposed to combustible materials, as well as causing damage to equipment through oxidation. As a consequence air lifts are a technically inferior option due to:

- Air specific gravity is higher than nitrogen and is less effective to lift column of well fluid due to its lower relative buoyancy.
- Gas lift technology has advanced since it was originally conceived in oilfield practice with pure nitrogen now commercially available.
- UK safety assessment does not classify the use of air as ALARP due to alternative inert gas options being available;
- Potential combustible mix with downhole fluids and oxidation risk causing corrosion; and
- The performance is inferior to a nitrogen lift which is more buoyant in fluids.

Air is not considered by the Operator as an available technique due to the safety and performance standards being inferior to alternative gases.

3.2.2.4 Hydrogen and oxygen:

The Operator has carried out a review of available literature and has not found any examples of either of these gases being used in gas lift operations for onshore oil and gas exploration.

Hydrogen and oxygen are not available techniques due to the explosive and potentially corrosive nature and lack of application to this commercial operation.

A further disadvantage is the need to design and manage the potential embrittlement of surface and sub surface pipework/ wellbore integrity due to hydrogen. As with CNG and LNG, considerable redesign of the wellhead configuration, gas lift valves (emergency shut down systems, backpressure valves, and check valves) and wellbore design would be required to manage the risk of injecting hydrogen or oxygen since they are combustible and explosive.

Due to the elevated risks associated with the corrosive and combustible and explosive properties and their incompatibility for use with the wellbore and surface architecture, neither of these gases are considered viable.

3.2.2.5 Natural gas from an alternative well:

The Operator has explored the potential to utilise natural gas from an existing adjacent producing wellbore. This scenario is not applicable to the exploration phase but may be viable in a future production scenario. Applicability of this technique requires reliable and known data including gas inventories and wellhead pressure to enable verified wellhead design and wellbore architecture.

A number of wells will be required to justify the large financial investment in a compressors (circa >£1M) to lift wells (if at all) and surface design would need to be planned for this technique to be viable and cost effective. This design would be necessary in order to carry out a suitable and sufficient risk assessment to allow the Operator to comply with health and safety regulation.

As an existing producing wellbore or known characteristics of the exploration phases is not currently available, or the known flow rates and pressures from varying well depths located in different horizons of the Bowland formation are unknown, the option is not viable until further geological data provides greater certainty.

3.2.3 BAT review for flaring and venting:

We also asked the Operator, in the event they concluded that Nitrogen lifting was still BAT, whether alternative flares could be used to achieve combustion of the natural gas/nitrogen mixture at an earlier opportunity.

The Operator considered alternative flares and has concluded that the current flare design is fit for purpose for the context of this well, flow rates and a 30%-98% design methane concentration. We have verified this information with the flare manufacturer and we are satisfied that the flare design and its configuration is appropriate for the proposed operations and is still considered BAT.

The operator has also examined whether there are any available options for treating gas when the methane concentration is less than 30%. For methane concentrations above 20% v/v the operator has proposed to

attempt the use of support fuel in order to sustain combustion within the flare. In order to prevent wasting fuel, the use of support fuel will be discontinued after 5 minutes if combustion is not achieved.

For methane concentrations below 20% the operator has considered the use of low calorific flare systems or cryogenic gas separation. Neither system can be justified through cost benefit analysis. Additionally, low calorific flares are unlikely to be capable of dealing with the total gas flow rate expected during a nitrogen lift.

We also requested additional information to ensure the BAT assessment considered how they will optimise the nitrogen flowrate for this well test, considering the coiled tubing size, injection rate, use of equipment (e.g. gas lift mandrels) and whether the lift process has been predesigned to reduce excess use of nitrogen or if they are constrained by using the coiled tubing and injection equipment already on site.

The Operator has confirmed that the nitrogen flowrate used will be kept to a minimum and that this is dictated by:

- a) the minimum nitrogen delivery rate from the surface injection equipment and;
- b) the rate required to evacuate the water from the velocity string.

The nitrogen rate required will be a function of the percentage water component in the flow and the reservoir pressure.

The Operator has given further consideration to the feasibility of achieving lower nitrogen rates through the direct discharge of nitrogen into the annulus rather than via a compressor with a minimum discharge rate.

As described in Section 7 of the BAT assessment, nitrogen is supplied in a liquefied low pressure status (<10bar) as this takes up 600 times less space than the gas, in comparison to compressed gas which takes up 200 times less space. The reason for delivering nitrogen in a liquefied and low pressure composition is to reduce the number of deliveries and transport safety. The wellhead pressure required to lift the well liquids is approx. 150-200 barg as outlined within section 7.0 of the BAT Assessment Gas Lift Techniques, and thus additional compression (with a fixed minimum design rate) is required in all circumstances.

Nitrogen lift will be terminated as soon as the well is able to achieve self-sustaining flow.

Gas lift mandrels are not required in this completion design as this is a temporary packerless completion. A packer is a standard component of the completion hardware of oil or gas wells used to provide a seal between the outside of the production tubing and the inside of the casing, liner, or wellbore wall. The packerless completion allows gas to build up in the annulus and helps to boost water up the tubing during slug flow in the clean-up, which further reduces nitrogen requirements.

The well test downhole completion is designed to have the smallest diameter tubing possible. This is done to maximise the velocity of the fluid flow up the well. This maximises the possibility of the well flowing naturally and reduces to a minimum the duration of the clean-up phase (i.e. the phase when nitrogen is used to lift flowback water out of the well). Through this completion design, the period for which nitrogen is required to clean up the well is minimised. The completion size is 2 3/8" outer diameter pipe. The minimum size is dictated by the requirement to utilise wireline retrievable plugs inside the tubing as the string is being run, so that well control barriers can be maintained. The outer diameter of these plugs is 1.5". Smaller plugs are not available, and hence the minimum tubing size is 2 3/8". The 2 3/8" string has been specifically procured for the purposes of the well test. Consequently due to the well design and sizing mechanical lifts are not available.

As mentioned in 3.1.1, the Operator will monitor gas concentrations in all returning well fluids being directed to the flare. Once methane concentrations reach 20%v/v, the Operator will undertake a supported ignition test (using propane as a support fuel). If ignition is not achieved after five minutes, the Operator will stop the addition of support fuel to prevent the release of unburnt propane. If this is the case, the Operator will continue to monitor the concentration of methane in the returning well fluids and repeat the supported ignition tests at each methane 5% increment above 20% v/v until ignition is successfully achieved. Ignition is expected when methane concentrations reach approximately 30% to 50% v/v.

We have required the operator to attempt the use of support fuel in the flare when the methane concentration in the feed gas reaches 20%. The start point for support fuel has been determined based on the flare parameters and cost/benefit analysis. Below 5%v/v methane in the return gas, the amount of carbon

dioxide released from propane combustion would exceed the carbon dioxide equivalent impact from venting the return gas so cannot be justified based on greenhouse gas emissions. At methane concentrations below 17%v/v, the cost of propane exceeds the benefit value of mitigating the methane release (based on the non-traded carbon cost) and therefore cannot be justified on cost grounds. We have therefore established that at 20%v/v methane in the return gas there is a clear benefit in starting the introduction of support fuel to try and achieve combustion.

Our assessment has concluded that nitrogen lifting constitutes Best Available Techniques in this specific case. We have reviewed the assessment and we agree with its conclusions.

3.2.4 Air Quality Modelling:

The Applicant has also submitted a detailed air quality modelling and assessment report to support their application. This report was done using conservative assumptions for the scale and duration of the nitrogen lift and has concluded that there would be no unacceptable impacts from this activity.

The Applicant has assessed the potential long-term and short-term impacts of nitrogen oxides and benzene at sensitive receptors. Since no combustion will occur during venting and there are no sulphurous compounds in the extracted gas, benzene is the main pollutant of concern for this variation. We have therefore focused our audit on evaluating potential impacts from benzene emissions from venting and flaring operations. Impacts of benzene are relevant for human health impacts only.

The way in which the Applicant used dispersion models, its selection of input data, use of background data and the assumptions it made have been reviewed by the Environment Agency's modelling specialists to establish the robustness of the Applicant's air impact assessment. Our review of the Applicant's assessment leads us to agree with the Applicant's conclusions. We are satisfied that the Predicted Environmental Concentrations of benzene at human receptors are not likely to exceed the Environmental Standards, and there is unlikely to be significant impacts as a result of the potential venting operation.

Within our checks, we agree that for the duration of the venting and modelled benzene mass releases, annual predictions are likely to remain below the insignificance criteria (i.e. below the 1% threshold criteria). Regarding short-term Process Contributions, our sensitivity to inter-yearly and meteorological variability indicate that predictions might be just above the insignificance threshold criterion of 10%. However, short-term predictions are likely to be conservative because they represent the maximum occurring at meteorological conditions for worst-case dispersion within the year, unlikely to occur during the venting scenario on a probability basis. We have assessed the potential impact and given the low background concentration and the size of the Process Contribution, the Predicted Environmental Concentration is well below the short-term Environmental Standards and we are satisfied that the use of nitrogen as lifting technique will not cause significant pollution.

3.2.5 Conclusions:

We are satisfied that the use of nitrogen to lift fluids from the well constitute BAT. We are also satisfied that the use of the existing flare design constitute BAT.

The Operator will minimise emissions of unburned methane by introducing support fuel to lower the duration of any venting at low methane concentration.

We are satisfied that the air quality modelling shows that emissions of benzene will be well below the short-term Environmental Standard and will not cause significant pollution when carried out for no more than 30 days.

We are limiting the duration of the nitrogen lift activity to a maximum of 30 days in table S1.1 and adding a requirement in table S3.6 to record in a venting days register the duration of any venting done as part of the nitrogen lift. Table S4.1 has also been amended to include this requirement.

In order to verify the validity of the of air quality modelling, we are requiring the Operator to analyse the flare feed gas for the presence of benzene and we have amended condition 3.5.7 to that effect and required them to provide that information to us in a shorter timeframe than previously stipulated (10 days from sampling taking place instead of 28 days from the date the analysis was carried out).

We have not imposed any additional monitoring requirement to measure the quantity of gas being flowed through the flare (whether combusted or not) and its composition (i.e. methane content) as part of this variation as these monitoring requirements are already in place in table S3.1.

3.3 Changes we have imposed

3.3.1 We have amended table S3.6 and S4.1 to add a requirement to provide continuous video monitoring of the flares while gas is being flowed to them.

We have included this change to add a requirement to video the flare continuously whilst it is operational (connected and the pilot light is on). This is to gather information on the flare performance at different feed gas flow rates.

4. General issues

4.1. Administrative issues

We are satisfied that the Applicant is the person who will have control over the operation of the regulated facility after we grant the Notice, in line with our Regulatory Guidance Note RGN 1: *Understanding the meaning of Operator (version 4.0)*; and that the Applicant will be able to operate the regulated facility in compliance with the conditions included in the consolidated permit.

4.2. Management

Having considered the information submitted in the application, we are satisfied that appropriate management systems and management structures will be in place.

4.3. Financial competence and relevant convictions

The variation does not include any changes that would require a change to the existing Financial Provision arrangements.

The Operator does not have any relevant convictions and it is technically competent.

4.4. External Emergency Plan

The provisions relating to an external emergency plan do not apply as none of the mining waste facilities are Category A facilities,

4.5. Accident management

Having considered the information submitted in the application, we are satisfied that appropriate measures will be in place to ensure that environmental accidents that may cause pollution are prevented. However, in the unlikely event that an accident should happen, we are satisfied that the consequences will be minimised. This is part of the written management system of the site, required under permit condition 1.1.1 a.

4.6. Surrender of the permit

When the Operator wants to surrender their permit, they will have to satisfy us that the necessary measures have been taken to:

- Avoid any on-going pollution risk resulting from the operation of the facility; and
- To return the site to a satisfactory state, having regard to the state of the site before the activity was put into operation.

We will not grant any application for surrender unless and until we are satisfied that these requirements have been complied with.

4.7. Site security and protection

The variation does not include any changes that would impact site security and protection.

4.8. Planning Permission

Our decision on whether to vary an Environmental Permit is separate from the planning process. A variation to an Environmental Permit allows the site to operate and to be regulated by the Environment Agency exercising its pollution control functions. The Planning Authority, in this case the Lancashire County Council, decides whether or not to grant planning permission.

The planning authority determines whether the activity is an acceptable use of the land. It considers matters such as visual impact, traffic and access issues, which do not form part of our Environmental Permit decision making process. The planning authority must also consider and respond to any objections they may receive on a particular planning application.

There is no requirement for planning permission to be in force before an environmental permit is granted.

4.9. Pollution prevention measures

The variation does not include any changes to the existing pollution prevention measures. As demonstrated above in section 3, although the use of nitrogen as a lifting technique may result in the venting of natural gas, we are satisfied that the operator is using Best Available Techniques and that the existing flares and their design remain appropriate.

4.10. Odour management

We carefully considered potential odour emissions from the activity during our determination.

Odour, from the activities we permit, is not considered likely to be an issue considering the site is in a rural location, which is 250 metres from the nearest sensitive receptor. In addition the regulated activities are not likely to produce any odours due to the processes and chemicals used being inherently non-odorous.

We are satisfied that the environmental risk assessments contain adequate measures to manage any potential odour and that the regulated activities will not cause pollution of the environment or harm to human health from odour.

Under Condition 3.3 of the permit, we can require the Operator to produce and implement an odour management plan in the unlikely event that activities at the site give rise to odour. Should a plan be required in the future, once we have assessed this plan as suitable, it will form part of the permit and the Operator must carry out the activity in accordance with the approved techniques.

4.11. Noise management

We carefully considered emissions from noise and vibration during our determination and concluded that noise and vibration from the regulated activities are not considered to be an issue due to the design of the flare, the rural location of the site, the distance to the nearest receptor (250 metres) and the level of background noise (the site is located close to the M55 and A583).

The risk of the flares themselves causing noise complaints is low. Based on the sound pressures presented by the Applicant, it is unlikely to cause a noise level that is greater than 10dB above background at the closest receptor (270m). As these figures assume the flares run at 100% capacity and the distances represent actual distances from the flare, we are satisfied that the environmental risk assessments contain adequate measures to manage noise and that the regulated activities will not cause pollution of the environment or harm to human health from noise.

Under Condition 3.4 of the permit, we can require the Operator to submit a specific noise and vibration management plan, should noise and vibration become a problem from activities we regulate. Should a plan be required in the future, once we have assessed this plan as suitable, it will form part of the permit and the Operator must carry out the activity in accordance with the approved techniques.

5. Other legal requirements

5.1. Mining Waste Directive 2006/21/EC

In this section we explain how we have addressed other relevant legal requirements under the Mining Waste Directive, to the extent that we have not addressed them elsewhere in this document and they apply to this variation.

5.1.1. Article 4 – General requirements

Article 4 sets out requirements for the protection of the environment and human health which apply to the management of extractive waste. Under the Environmental Permitting (England and Wales) Regulations 2016 an environmental permit is required for a mining waste operation, which is defined as the management of waste whether or not it involves a waste facility. It is through the permit and the conditions imposed that we are satisfied that the provisions of Article 4 will be met.

5.1.2. Article 5 - Waste management plan

This includes the requirement for the Operator to provide a Waste Management Plan and the information required within this. The waste management plan, including associated documents, has been assessed in accordance with these requirements and is approved subject to conditions. Condition 2.3.1 ensures that the operations are limited to those described in the WMP and in table S1.2. It also ensures that the Operator follows the techniques set out and that any deviation will require our written approval. Any significant changes will require a formal variation of the permit. Where a condition imposes a specific requirement that will take precedence over anything in the plan.

5.1.3. Article 6 – Major accident prevention

We are satisfied that the proposed activities do not involve a Mining Waste Facility which should be classified as a Category A facility.

5.1.4. Article 7 – Application for a permit

The permit covers the management of extractive waste and includes a Mining Waste Facility as defined in the MWD. The Application contained all necessary elements in Article 7(2) relevant to this site. We are satisfied that the requirements in Article 7(3) are met.

5.1.5. Article 8 – Public participation

Through our consultation procedure we are satisfied that the public have been informed as required by Article 8 and that we have made available the information set out in Article 8(2). We have provided the public with the ability to express comments and opinions to us before a decision has been taken and the results of the consultation will be taken into account in deciding whether to grant this permit.

5.1.6. Article 9 – Classification system for waste facilities

We are satisfied that there is no waste facility that should be classified as a category A facility. Although the waste facility in respect of the on-site storage of waste will contain hazardous waste during the operational phase, no waste is expected to be present at the end of the planned period of operation.

5.1.7 Article 11- Construction and management of facilities

This outlines a requirement for the facility to be suitably constructed, managed and maintained to ensure its physical stability and to prevent pollution and contamination of soil, air, surface water and groundwater. Under this article there is a requirement for suitable plans and arrangements for regular monitoring and inspection of the facility by competent persons.

We are satisfied that the operator will comply with these requirements, based on the information provided and the conditions in the permit.

5.1.8. Article 13 - Prevention of water status deterioration, air and soil pollution

We are required, as the competent authority, to be satisfied that the Operator has taken the necessary measures in order to meet environmental standards, particularly to prevent deterioration of current water status.

We are satisfied that the Operator will comply with these requirements based on the information provided and the conditions in the permit.

5.1.9. Article 14 - Financial Guarantee

Article 14 requires the provision of a financial guarantee, in respect of a waste facility, to ensure funds are available to meet the obligations of the permit and to rehabilitate the site when operations finish. We will require a financial guarantee to be provided in respect of the area designated for the accumulation or deposit of hazardous waste stored at the surface before any permit is issued to satisfy this requirement.

In respect of the waste facility relating to waste fluid left in the formation, we are satisfied that this waste is properly characterised as non-hazardous waste. By virtue of paragraph 9(3) of Schedule 20 to the Environmental Permitting (England and Wales) Regulations 2016 the requirements mentioned in Article 2(3) of the MWD are waived. These waived requirements include the need for a financial guarantee for non-hazardous waste, unless deposited in a Category A facility. So no financial guarantee can be required in respect of the fluid left in the target formation.

5.2. Further legislation

5.2.1 Industrial Emissions Directive (IED)

We have addressed the requirements of the IED as part of the determination of the original permit. The changes made by this variation do not change that assessment.

5.2.3. Directive 2003/35/EC – The Public Participation Directive

Regulation 60 of the EPR 2016 requires the Environment Agency to prepare and publish a statement of its policies for complying with its public participation duties. We have published our public participation statement.

This Application has been consulted upon, in line with that statement, as well as with our guidance RGS6 on Sites of High Public Interest, which addresses specifically extended consultation arrangements for determinations where public interest is particularly high. This satisfies the requirements of the Public Participation Directive.

Our decision in this case has been reached following a programme of extended public consultation, both on the original application and later, separately, on this permit and a decision document. The way in which this has been done is set out in Section 2. A summary of the responses received to our consultations and our consideration of them is set out in Annex 1.

The guidance contains objectives in relation to the Environment Agency's operational functions and corporate strategy. Some of these objectives relate to the Environment Agency's wider role in waste management and strategy. In respect of the management of extractive waste, the guidance notes state that the Environment Agency should pursue the following objective:

“to prevent or reduce as far as possible any adverse effects on the environment as well as any resultant risk to human health from the management of waste from the quarrying and mineral extraction industries.”

In respect of water quality, the Environment Agency is required to: *‘protect, enhance and restore the environmental quality of inland and coastal surface water and groundwater, and in particular:*

- *To address both point source and diffuse pollution;*
- *To implement the EC Water Framework Directive; and to ensure that all relevant quality standards are met.’*

In respect of regulation of industrial pollution through the EPR, the Guidance refers in particular to the objective of setting permit conditions “*in a consistent and proportionate fashion based on Best Available Techniques and taking into account all relevant matters...*”.

The Environment Agency considers that it has pursued the objectives set out in the Government’s guidance, where relevant, and that there are no additional conditions that should be included in this Permit to take account of the Section 4 duty

5.2.5. Section 5 Environment Act 1995 (preventing or minimising effects of pollution to the environment)

We are satisfied that our pollution control powers have been exercised for the purpose of preventing or minimising, or remedying or mitigating the effects of pollution of the environment in accordance with section 5 of the Environment Act 1995.

5.2.5. Section 7 Environment Act 1995 (pursuit of conservation interests)

Section 7(1)(c) of the Environment Act 1995 places a duty on us, when considering any proposal relating to our functions, to have regard amongst others to any effect which the proposals would have on the beauty and amenity of any urban or rural area.

We do not consider that any conditions additional to those in the permit are required to meet this duty. The structures that could affect visual amenity will be the drilling rig and the flares. These structures are temporary in nature and any visual impact will be limited.

5.2.6. Section 81 Environment Act 1995

The site is not within a designated Air Quality Management Area.

We consider that we have taken our decision in compliance with the National Air Quality Strategy and that there are no additional or different conditions that should be included in this variation.

5.2.7. Section 40 Natural Environment and Rural Communities Act 2006

Section 40 places a duty on us to have regard, so far as it is consistent with the proper exercise of our functions, to conserving biodiversity. ‘Conserving biodiversity’ includes, in relation to a living organism or type of habitat, restoring or enhancing a population or habitat. We have done so and consider that no conditions additional or different to those in the permit are required.

5.2.8. Section 23 of the Local Democracy, Economic Development and Construction Act 2009

Section 23 requires us, where we consider it appropriate, to take such steps as we consider appropriate to secure the involvement of interested persons in the exercise of our functions by providing them with information, consulting them or involving them in any other way. Section 24 requires us to have regard to any Secretary of State guidance as to how we should do that.

The way in which the Environment Agency has consulted with the public and other interested parties is set out in this document. The way in which we have taken account of the representations we have received is set out in annex 1. Our public consultation duties are also set out in the Environmental Permitting (England and Wales) Regulations 2016, and our statutory Public Participation Statement, which implement the requirements of the Public Participation Directive. In addition to meeting our consultation responsibilities, we have also taken account of our guidance in Environment Agency Guidance Note RGS6 and the Environment Agency’s Building Trust with Communities toolkit.

5.2.10. Human Rights Act 1998

We have considered any potential interference with rights under the European Convention on Human Rights in reaching our decision and consider that our decision is compatible with our duties under the Human Rights Act 1998. In particular, we have considered the right to life (Article 2), the right to a fair trial (Article 6), the right to respect for private and family life (Article 8) and the right to protection of property (Article 1, First Protocol). We do not believe that Convention rights are engaged in relation to this determination and to the extent that they may be, any interference with those rights is justified.

5.2.11. Countryside and Rights of Way Act 2000 (CROW 2000)

Section 85 of this Act imposes a duty on Environment Agency to have regard to the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty (AONB). There is no AONB which could be affected by the variation of the permit.

5.2.12. Wildlife and Countryside Act 1981

Under section 28G of the Wildlife and Countryside Act 1981 the Environment Agency has a duty to take reasonable steps to further the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which a site is of special scientific interest. Under section 28I the Environment Agency has a duty to consult Natural England in relation to any permit that is likely to damage SSSIs.

We have assessed the application and concluded that there will be no likely damage to any SSSIs as there is no change to the overall impact of the activities - see section 7.2 and 7.6 of our original Decision Document.

5.2.13. The Conservation of Habitats and Species Regulations 2017

We have assessed the Application in accordance with guidance agreed jointly with Natural England and concluded that there will be no likely significant effect on any European Site.

The assessment we carried out as part of the determination of the original permit took into account the potential impacts from the continuous incineration of gas for 365 days and this impact was been fully assessed and is detailed in section 7.6 of the original Decision Document. Following our assessment we were satisfied that there would be no likely significant effect on the statutory conservation sites (SAC/SPA/Ramsars) from air emissions and that assessment remains valid. We presented our assessment and conclusion to Natural England on an Appendix 11 form (Habitats Directive: Form for recording likely significant effect) for information as part of the determination of the original application. Natural England responded, agreeing with our conclusions.

We have also considered our general duties under Regulations 9 and 9A and are satisfied the proposal poses no risk to habitats or species or wild birds

5.2.14. Section 108 Deregulation Act 2015 – Growth duty

We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit.

Paragraph 1.3 of the guidance says:

“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”

We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.

We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

Annex 1 – Consultation

The following summarises the responses to consultation with other organisations, our notice on GOV.UK for the public, and the way in which we have considered these in the determination process.

A) Advertising and Consultation on the Application

The Application has been advertised and consulted upon in accordance with the Environment Agency's Public Participation Statement. The way in which this has been carried out, along with the results of our consultation and how we have taken consultation responses into account in reaching our decision, is summarised in this Annex. Copies of all consultation responses have been placed on the Environment Agency public registers.

The Application was available online on the Environment Agency's Citizen Space website from 16th July 2019 to 13th August 2019. Copies of the Application were placed in the Environment Agency Public Register at Richard Fairclough House, Knutsford House, Latchford, Warrington WA4 1HT.

The following statutory and non-statutory bodies were consulted:

- Local Planning Authority – Lancashire County Council
- Public Health England
- Director of Public Health – Lancashire County Council
- Health and Safety Executive
- Mineral Planning Authority – Lancashire County Council

Consultation Responses from Statutory and Non-Statutory Bodies

Response Received from Public Health England	
Brief summary of issues raised:	Summary of action taken / how this has been covered
The main emissions of potential concern are releases to the atmosphere. However, based on the information contained in the application supplied to us, Public Health England has no significant concerns regarding the risk to the health of the local population from the installation.	None required

2) Consultation Responses from Members of the Public and Community Organisations

A total of 300 responses were received.

Although the consultation ended on 13/08/2019, any comments that have been received after the close of the consultation and prior to issue were taken into consideration as part of our determination process.

We can only consider comments which are relevant to changes proposed under the variation application.

Summaries of the consultation responses and how we have addressed them are as follows:

Quantity of methane being released

Concerns were raised about the quantity of methane potentially being released

Although there is the potential for the nitrogen lift to result in the release of uncombusted natural gas (which is mainly methane), we are satisfied that the operation has been designed to minimise the quantity of natural gas being vented. The Operator will monitor the concentration of methane in the returning fluid and carry out ignition tests using propane as a support fuel starting at 20% v/v methane to try to achieve unassisted combustion at the earliest opportunity, therefore minimising the amount of natural gas being vented uncombusted.

BAT assessment

Concerns have been raised that the Operator BAT assessment was not appropriate.

As part of our determination, we have carried out a review of the Operator's BAT assessment and requested additional information to ensure that the BAT assessment was appropriate for the proposed activity.

Details of our review of the BAT assessment can be found in section 3.1.1 above.

We are satisfied that the BAT assessment carried out by the Applicant is appropriate.

Benzene

Concerns have been raised regarding the potential release of benzene from the activities.

The applicant has supplied a detailed Air Quality Assessment as part of their application and this assessment has considered benzene emissions.

We have carried out a detailed review of the report and we have assessed the potential impact and given the low background concentration and the size of the Process Contribution, the Predicted Environmental Concentration is well below the short-term Environmental Standards and we are satisfied that the use of nitrogen as lifting technique will not cause significant pollution.

Number of variations:

Concerns were raised about the number of variations that have been applied for the site operations.

It is standard practice for an Operator to review their operations as they progress and make adjustments or changes and the Operator has an obligation to apply for a variation of the permit to ensure those changes are appropriately controlled. In other sectors, this would happen over the life of the site, potentially many years. However in this case, the activities are time-limited and as a result a number of variations have been applied for over a relatively short period of time.

The original permit was granted in 2015 and since then the Operator has carried out work on site and made changes to their procedures, plant design and operations based on site and activity specific knowledge developed during the initial period of operation. We have a duty to ensure that the permit accurately reflects the activities on site and as part of our continuous compliance work, where we have identified that improvements can be made, we have also taken the opportunity to make changes to the permit.

Tremors:

A number of concerns were raised about the tremors associated with previous activities on site and the potential for the new activities to induce tremors.

We are satisfied that the changes in this variation do not increase the potential for tremors. Any changes to the fracturing process would form part of the approval of the relevant Hydraulic Fracturing Plan, which is a separate process to this variation and is done in association with the Oil and Gas Authority and the Health and Safety Executive who have joint responsibility for this issue.

Climate change policy

Concerns were raised about the impacts of the activities on climate change.

Policy is made by the government. Government policy states “We aim to maximise the economic recovery of oil and gas from the UK’s oil and gas reserves, taking full account of environmental, social and economic objectives”.

We are aware, however, that the exploitation of Shale Gas carries with it the risk of pollution to the environment. In light of this, and having regard to the fact that the site is in an exploratory phase, we have required that the Operator use BAT so as to minimise the risk of pollution occurring. We are satisfied that the measures which are in place represent best available techniques which will ensure that no significant pollution will occur as a result of the use nitrogen lifting.