

Draft decision document

Environment Agency Permitting Decisions

Consultation on our decision document recording our decision making process

The Permit Number is: EPR/DB3002HE

The Applicant/Operator is: Third Energy UK Gas Limited

The Site is located at: Kirby Misperton A Wellsite
Off Habton Road
Kirby Misperton
North Yorkshire
YO17 6XS

Consultation commenced on: 10 June 2015

Consultation ended on: 07 August 2015

Minded to consultation commenced on: 02 December 2015

Minded to consultation ends on: 15 January 2016

Purpose of this document

This is a draft decision document, which accompanies a draft permit.

It explains how we have considered the Applicant's application, and why we have included the specific conditions in the draft permit we are proposing to issue 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.

The document is in draft at this stage, because we have yet to make a final decision. Before we make this decision we want to explain our current thinking to the public and other interested parties, to give them a chance to understand that thinking and, if they wish, to make relevant representations to us. We will make our final decision only after carefully taking into account any relevant matter raised in the responses we

receive. Our mind remains open at this stage: although we believe we have covered all the relevant issues and reached a reasonable conclusion, our ultimate decision could yet be affected by any information that is relevant to the issues we have to consider. However, unless we receive information that leads us to alter the conditions in the draft permit, or to reject the Application altogether, we will grant the permit in its current form.

In this document we frequently say “we have decided”. That gives the impression that our mind is already made up; but as we have explained above, we have not yet done so. The language we use enables this document to become the final decision document in due course with no more re-drafting than is absolutely necessary.

Structure of this document

Preliminary Information

Use of Terms

Summary of the Application

- 1. Summary of our proposed decision**
- 2. How we took our decision**
- 3. Outline of proposed process**
 - 3.1 Pre-stimulation workover
 - 3.2 Hydraulic Fracture stimulation / well test
 - 3.3 Production Testing
 - 3.4 Production
 - 3.5 Site Restoration
- 4. The legal framework**
- 5. Description of the operation**
 - 5.1 Description of the site and related issues
 - 5.1.1 Location
 - 5.1.2 Waste management activities
 - 5.1.3 Description of groundwater activity
 - 5.1.4 Classification of the waste facility
- 6. General issues**
 - 6.1 Administrative issues
 - 6.2 Management
 - 6.3 Financial competence and relevant convictions
 - 6.4 External emergency plan
 - 6.5 Accident management
 - 6.6 Surrender of the permit
 - 6.7 Site security and protection
 - 6.8 Planning permission
 - 6.9 Site condition report
 - 6.10 Pollution prevention measures
 - 6.11 Storage arrangements

6.12 Odour management

6.13 Noise management

7. Environmental issues and their control

7.1 Assessment of environmental impacts

7.2 Nature conservation

7.3 Assessment of potential impacts to surface water and groundwater

7.4 Waste Management Plan

7.5 Setting permit conditions

7.6 Protection of groundwater

7.7 Emissions to air

7.8 Monitoring

7.9 Site stability and seismicity

7.10 Other legal requirements

8. Pre operational conditions

Annex 1 Consultation, web publicising and newspaper advertising

A. Advertising and Consultation on the Application

- 1) Consultation responses from Statutory and Non-Statutory Bodies
- 2) Consultation responses from Members of the Public and Community Organisations
- 3) Other matters outside the scope of this permit Application that the public have commented on which may be more relevant to Applications for other permissions

DRAFT

Preliminary information

The application we received contained proposals for 2 activities (the management of mining waste and a groundwater activity). We gave the application for these activities the reference number EPR/DB3002HE/A001. We refer to the Application as “the **Application**” in this document for consistency.

The Applicant also submitted a permit application for a radioactive substances activity, which we have given the application number EPR/KB3098DE/A001. That application is for a separate permit. The decision with regards to that application is not dealt with in this document. A separate decision document is being consulted upon in conjunction with this document to explain the minded to position on that application.

The number we have given to the draft permit is EPR/DB3002HE. We refer to the draft permit as “the **Permit**” in this document.

The Application was duly made on 03 June 2015.

The Application relates to the following proposed operations as described in the WMP, which comprise 5 phases:

1. Pre-stimulation workover,
2. Hydraulic fracture stimulation / well test,
3. Production test,
4. Possible production, and
5. Site restoration

The site for the proposed activities is located within open countryside in the Vale of Pickering, approximately 700m south west of Kirby Misperton village in North Yorkshire. The national grid reference for the centre of the site is NGR: SE 77133 79002.

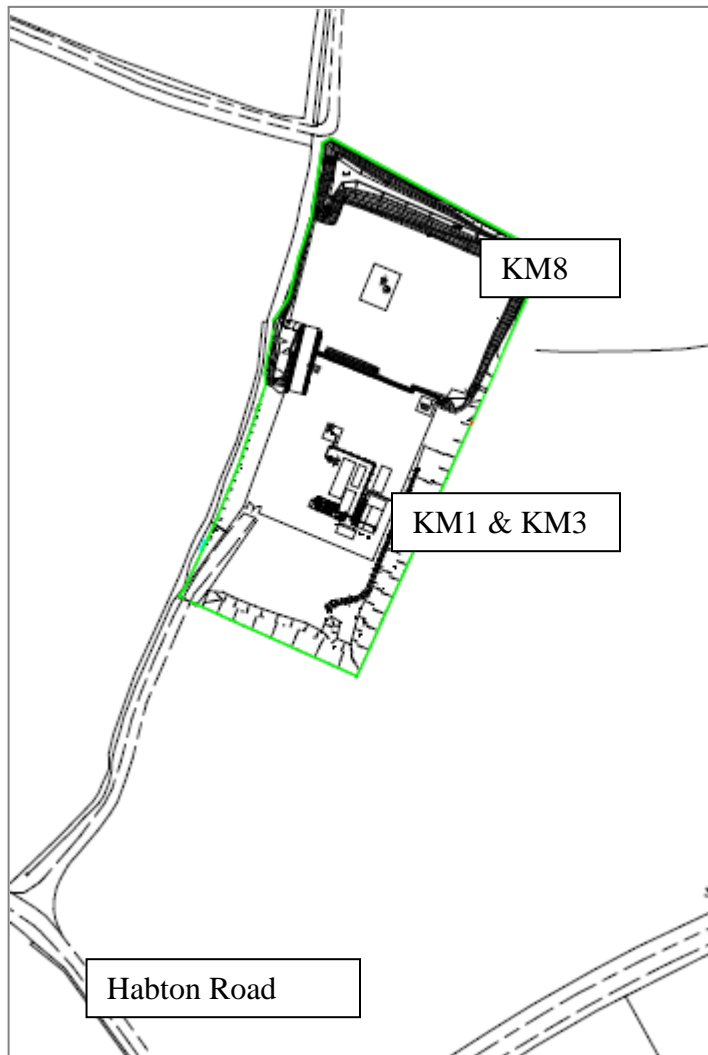
The Kirby Misperton A (KMA) wellsite consists of two independent sites, constructed immediately adjacent to each other which share the same access. (See diagram below).

KMA wellsite comprises the original well known as Kirby Misperton 1 (and more recently as KM7, following a sidetrack in 2012), constructed in 1984, and currently not in use, i.e. suspended. A second well was constructed in 1987 known as KM3, this is now used for reinjection of produced water from other gas producing wells operated by the Applicant and regulated by an Environmental Permit (NPSWQD001330).

An extension to the original KMA wellsite was constructed in 2013 and from here the KM8 well was drilled; no other operations or activities have taken place on the extension site to date. This Application relates to a proposal to hydraulically fracture the Bowland Shale Formation using the existing KM8 well. The KM8 well will need to be cleaned out, but no further drilling is required.

KM8 will be operated as a separate gas production well. There is no subsurface connectivity between the KM8 well and the KM1 (KM7) or KM3 wells, although some of the existing surface infrastructure (pipework) will be used.

Site layout



Use of terms

The Applicant is Third Energy UK Gas Limited. We refer to Third Energy UK Gas Limited as “the **Applicant**” in this document. Where we are talking about what would happen once any Permit is granted, we call Third Energy UK Gas Limited “the **Operator**”.

Additive

Chemical or chemicals manually added to clean water, or to flowback fluid and clean water, to assist with the hydraulic fracturing process.

Exploration

Activities carried out to provide information about geological structures and the presence or absence of gas reserves together with assessments to determine whether the reservoir development is economically feasible.

Extractive waste

Extractive waste is waste directly resulting from the prospecting, extraction, treatment and storage of mineral resources and the working of quarries.

Flowback fluid

A mixture of hydraulic fracturing fluid, which may include mobilised natural gas and formation water which returns to the surface following the hydraulic fracturing process.

Hydraulic fracturing fluid

The fluid injected into the formation under pressure, and which consists predominantly of clean water, or reusable flowback fluid and clean water, together with a proppant (sand) and a friction reducer.

Regulated facility

This is the term used in the Environmental Permitting (England and Wales) Regulations 2010. Those Regulations provide that any regulated facility must be operated only under and in accordance with an environmental permit. The term is defined in the Regulations so as to include a “mining waste operation”, and a “groundwater activity”.

A “mining waste operation” is further defined so as to include the management of extractive waste, whether or not it involves a waste facility.

Reservoir

The rock formation in which the hydrocarbon being targeted is held; in this case this is the Bowland Shale Formation.

Target formation

The geological formation specifically being targeted by the activities to assess whether hydrocarbons are present, their extent and the potential future well

performance. For the purpose of this Application, the target formation is the Bowland Shale.

Well / wellbore / borehole

The engineered construction through which the hydrocarbon is to be extracted.

This decision document:

- explains how the application has been determined
- provides a record of the decision-making process
- shows how all relevant factors have been taken into account
- justifies the specific conditions in the permit other than those in our generic permit template.

Unless the decision document specifies otherwise we have accepted the Applicant's proposals.

DRAFT

Summary of the Application

This Application is for a permit for activities at Kirby Misperton A wellsite, specifically at well KM8, relating to well stimulation by hydraulic fracturing for natural gas extraction, namely:

1. A mining waste operation for the management of extractive waste not involving a mining waste facility; and
2. In respect of the hydraulically fractured well; a non-hazardous mining waste facility for the accumulation of injected hydraulic fracturing fluid which has not returned back from the underground target formation and has become extractive waste; and
3. A groundwater activity, being a discharge, namely of hydraulic fracturing fluid, to the target formation, that might lead to the indirect input of pollutants to groundwater.

As the flowback fluid arising from the activities has the potential to contain low levels of Naturally Occurring Radioactive Material (NORM) at activity levels sufficient for it to be classed as radioactive waste, the Applicant has also applied for a separate Radioactive Substances Activity (RSR) permit which will regulate the ways in which the radioactive material is managed, (application EPR/KB3098DE/A001).

If the Applicant wishes to carry out different or additional activities, to those detailed above, a variation of the permit will be required.

Any such variation application would be determined on its merits and would be subject to our normal consultation process. Any application to vary will also require an amended Waste Management Plan (WMP) to be submitted.

Except where a permit condition imposes a different requirement, the Permit requires the Operator to comply with the techniques in the WMP and limits the activities to those stated unless otherwise agreed in writing by the Environment Agency. We will only authorise minor amendments to the WMP without the need to vary the Permit.

1. Summary of our decision

We are minded to grant the Permit to the Applicant.

This will allow the Operator to operate the mining waste operation for the management of extractive waste arising from the proposed activities as set out in their WMP, subject to conditions in the Permit. The Permit will also allow a groundwater activity; i.e. a discharge that might lead to an indirect input of pollutants to groundwater. The permit conditions relating to groundwater require measures to be taken to limit the input

of any non-hazardous substances to groundwater.

We consider that, in reaching that decision, we have taken into account all relevant considerations and legal requirements, and are satisfied that the permit will ensure a high level of protection is provided for the environment and human health.

The Permit includes 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 2010, Mining Waste 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 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 3 June 2015. 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 2010 (the 2010 Regulations) and our statutory Public Participation Statement. We extended our normal initial consultation period of 4 weeks to provide an 8 week period of time. We advertised 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. The Application was also made available to view on the Environment Agency's E-consultation tool website.

A drop in session was held for the public at Kirby Misperton Village Hall on 16 June 2015.

We placed adverts in the Malton & Pickering Mercury, Yorkshire Gazette & Herald on 10 June 2015 and Scarborough Evening News on 11 June 2015 as well as contacting local MPs, MEPs, local authorities, local councillors, Parish Councils, local schools and Flamingo Land to notify them of the consultation. We also issued a press release which was picked up by various local newspapers, and local radio and television news media.

We placed a copy of the Application and all other documents relevant to our

determination on our Public Register. Copies of the Application were also held at the following locations:

The Environment Agency, Lateral, 8 City Walk, Leeds, LS11 9AT.

The Environment Agency, Coverdale House, Aviator Court, Amy Johnson Way, Clifton Moor, York, YO30 4GZ.

Malton Library, St Michael Street, Malton, North Yorkshire, YO17 7LJ.

Pickering Library, The Ropery, Pickering, North Yorkshire, YO18 8DY

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 Authority: Ryedale District Council
- Mineral Planning Authority: North Yorkshire County Council
- Health and Safety Executive
- Public Health England
- Director of Public Health
- Water Company: Yorkshire Water
- Food Standards Agency

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 through a formal request under Schedule 5 to the Environmental Permitting (England and Wales) Regulations 2010.

We have made publicly available information provided by the Applicant in the form of a response to our Schedule 5 notice and information received subsequent to those responses. This information was necessary to determine the Application.

As with the initial application the new information was made available on our public register and on the Environment Agency's E-Consultation website. We contacted local stakeholders and those that contacted us during the consultation to notify them of the 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 these representations and have taken into account any relevant points in reaching our draft determination.

3. Outline of proposed process

There is an existing well at KM8 that was drilled in 2013 down to 3,099m (true vertical depth) into the Bowland Shale Formation. No gas has ever been extracted from the well and it was suspended. The Applicant has decided to use the well stimulation technique of hydraulic fracturing to try to extract natural gas from the Bowland Shale Formation. There will be five fractures perforated through the existing vertical well casing. There are no lateral wells extending outwards, and no proposals to carry out any further drilling.

The Waste Management Plan (WMP) is the principal document for the management of mining waste under the Environmental Permitting Regulations 2010. The grant of the Permit represents the approval of the WMP, subject to any permit conditions, and requires the Operator to comply with the techniques described in the WMP.

The planned operations as described in the WMP comprise 5 phases:

1. Pre-stimulation workover,
2. Hydraulic fracture stimulation / well test,
3. Production test,
4. Possible production, and
5. Site restoration

We regulate the management of the extractive wastes arising from these different phases of the activity. We do not regulate the hydraulic fracturing process itself, although we do regulate any discharge of fracturing fluid that might lead to an indirect input of pollutants to groundwater.

The natural gas extracted during testing will be a product rather than waste. The infrastructure is in place at the KMA wellsite, with some minor alterations, to connect the KM8 well to the Operator's central gathering point, Knapton Generating Station, where the gas will be combusted to produce energy to feed directly into the national electricity grid. Knapton Generating Station is operated subject to the controls of an Environmental permit and regulated to minimise impact on the environment.

There will be no need or requirement to discard any natural gas produced; as a result, there will be no flaring of gas from KM8.

3.1 Pre-stimulation workover

The well needs to be cleaned out and perforated prior to the well testing stage; this step is anticipated to take 2 weeks, and will be carried out 24 hours a day.

A workover rig will be brought on site to prepare the KM8 well as the borehole has been closed since the drilling operation was completed. A circulating string which is set into the well must be removed using the workover rig.

The borehole will then be surveyed using wireline tools and the integrity of the well will

be checked by pressure testing, in order to provide assurance that the construction of the borehole is still sound thus protecting groundwater and preventing any pathways forming to receptors.

The results of the integrity test will be sent to the Health & Safety Executive (HSE), and will be submitted to the Environment Agency as required by the permit, as a pre-operational condition.

Perforating the well casing

The well casing will be perforated at the five pre-determined zones, using tubing conveyed perforating guns. Once the well casing has been perforated the perforating guns are brought back to the surface. The perforating guns are designed to minimise debris by reducing external burrs (steel edges) which form as the explosive charge fires through the casing.

The well bore will be cleaned out by circulating fresh water to remove any debris left from the perforations; at the surface the water and the debris (steel scrapings) are separated and placed in the appropriate storage facility for removal off site, either for recycling or disposal at an authorised waste treatment facility. If the quality of the water is suitable, it may be reused for other processes on site.

The final element in this stage is to insert a completion string into the borehole; this string contains completion packers that will isolate the five perforated zones to be hydraulically fractured. Further pressure testing is carried out to confirm the integrity of the well. When this stage has been satisfactorily carried out, the workover rig will be de-mobilised.

3.2 Hydraulic Fracture stimulation / well test

The second stage is the hydraulic fracturing stimulation, this can only commence once the Operator has an approved Hydraulic Fracture Plan (HFP) in place. This would be approved by Department of Energy & Climate Change (DECC). The Environment Agency will review and must approve the sections pertaining to the permitted activities and the Waste Management Plan; the Operator must carry out the fracturing operations in accordance with that HFP.

Hydraulic fracturing is a well stimulation technique which is undertaken to improve the flow of hydrocarbons through relatively impermeable underground rocks. It is used in situations where, under natural permeability conditions, hydrocarbons will not flow freely, for example in rocks such as shale.

The process entails pumping water based fluid into the well at a pressure high enough to enable pre-existing small fractures in the target formation to open up. At the same time, proppant (sand) is injected into the fractures to hold them open once the water pressure is released. The fractures will connect the pore spaces in the shale to the well. Natural gas trapped in the target formation can then flow through the fractures and into the well when the flow is reversed.

This stage is anticipated to take approximately 6 weeks to complete and will be carried out during daylight hours only.

Firstly the hydraulic fracturing equipment will be brought onto site and set up, and preparations made for carrying out the hydraulic fracturing process.

There are five fracture zones proposed; approximately three initial fracture tests will be undertaken per zone, using the hydraulic fracturing fluid without the proppant. These tests will determine the different pressures needed and provide important data for use in establishing the parameters of each of the five main stimulations.

The main hydraulic fractures will take place, starting with the lowest fracture zone at around 3040m and working up the vertical well to the most shallow fracture zone, around 2126m. Each individual fracturing operation is anticipated to take about 5 hours to complete. Each of the five zones will be cleaned out and then isolated with a bridge plug before the next fracture occurs.

All fractures will be completed using the minimal amount of water necessary, based on the data gathered during the initial fracture tests. The water volumes required will vary depending on depth and extent of the individual fractures as shown in Table 1 below.

Following each fracture the pressure is released at the surface to reverse the flow of the fracturing fluid, a process referred to as post-hydraulic fracturing flowback, or simply 'flowback'. If there is water naturally present within pores in the target formation, it may also flow back along with the returning fracturing fluid. The resulting mixture which returns to the surface is referred to as flowback fluid.

Flowback fluid may contain Naturally Occurring Radioactive Material (NORM) in solution, derived from the target formation. The application for the Radioactive Substances permit referred to in the Summary above deals with this aspect.

Between 30% and 50% of the injected fracturing fluid is expected to return to the surface, depending on geological conditions. The returning flowback fluid will be stored on site and where feasible, will be reused for future hydraulic fracturing stages following electrocoagulation treatment. Whether the flowback fluid will be treated and reused in subsequent hydraulic fracture treatments depends on actual flowback rates following the hydraulic fracture treatment. If flowback rates are slow, the time required to accumulate sufficient flowback fluid for treatment and reuse will increase, extending the overall duration of hydraulic fracturing operation and associated impacts.

If it is not possible to reuse the flowback fluid, it will be considered waste and taken offsite for disposal, to an appropriately permitted treatment facility.

The reuse of the flowback fluid reduces the volume of fresh water that is needed and subsequently, the amount of fluid that may require disposal offsite at a permitted treatment facility.

A proportion of the injected fluid will remain within the formation and will mix with any water released from the formation by the fracturing process. Some of the fluid remaining underground is expected to be reabsorbed into the rock within the target formation. The retained hydraulic fracturing fluid will become indistinguishable from formation water already present in the formation.

When the fluid no longer serves a useful purpose, any fluids remaining underground will be regarded as extractive waste. This waste will remain in the target formation; for more details see section 7.6 of this document.

Hydraulic fracture fluid

The Applicant has provided a list of base chemical substances proposed for use within the hydraulic fracture fluid which have been assessed based on the Joint Agencies Groundwater Directive Advisory Group (JAGDAG) – *Methodology for the determination of hazardous substances for the purposes of the Groundwater directive (2006/118/EC)*.

The chemicals on the Applicant's list have all been assessed as non-hazardous in terms of persistence, bioaccumulation and toxicity in line with the relevant guidance notes: Technical Guidance document and Regulation (EC) 1907/2006 the Regulations, Evaluation, Authorisation and Restriction of Chemicals (REACH), and CLP Regulations (Classification, Labelling and Packaging of Substances and Mixtures), and European Chemicals Agency Guidance on CLP (ECHA 2009).

The criteria for assessment are from Schedule 22 to the Environmental Permitting (England and Wales) Regulations 2010, namely:

Meaning of "hazardous substance"

4.—(1) A hazardous substance is any substance or group of substances that are toxic, persistent and liable to bio-accumulate.

(2) This includes in particular the following when they are toxic, persistent and liable to bio-accumulate—

- (a) organohalogen compounds and substances which may form such compounds in the aquatic environment,
- (b) organophosphorous compounds,
- (c) organotin compounds,
- (d) substances and preparations, or the breakdown products of such, which have been proved to possess carcinogenic or mutagenic properties or properties which may affect steroidogenic, thyroid, reproduction or other endocrine-related functions in or via the aquatic environment,
- (e) persistent hydrocarbons and persistent and bioaccumulable organic toxic substances,
- (f) cyanides,
- (g) metals (in particular, cadmium and mercury) and their compounds,
- (h) arsenic and its compounds,
- (i) biocides and plant protection products.

(3) The regulator must publish a list of substances that it considers to be hazardous substances.

Meaning of “**non-hazardous pollutant**”

5. A non-hazardous pollutant is any pollutant other than a hazardous substance

We are satisfied that the chemicals that are proposed for use in the hydraulic fracturing fluid are correctly classified as non-hazardous to groundwater. The Operator is not permitted to use any chemical that is not on this list within the WMP.

The Applicant’s list of the hydraulic fracture fluids proposed for the KM8 hydraulic fracturing operation, (Appendix 5 of WMP). The list comprises a description of the fluid additive and the quantities proposed, summarised in Table 1 below. The full list may be found in the WMP.

Table 1. Composition of hydraulic fracture fluid:

	Fracture 5 Zone A depth: ~ 2,126m	Fracture 4 Zone B depth: ~ 2,250m	Fracture 3 Zone C depth: ~ 2,655m	Fracture 2 Zone D depth: ~ 2,763m	Fracture 1 Zone E depth: ~ 3,040m
Water	425m ³	442m ³	475m ³	701m ³	1249m ³
Sand	48 tonnes	51 tonnes	54 tonnes	87 tonnes	80 tonnes
Salt	8.5 tonnes	8.8 tonnes	9.5 tonnes	14 tonnes	25 tonnes
Gelling Agent	2.2 tonnes	2.3 tonnes	2.7 tonnes	4.1 tonnes	4.5 tonnes
Crosslinker	3m ³	3.1m ³	3.5m ³	5.7m ³	0.0
Gel breaker	0.1 tonnes	0.1 tonnes	0.0	0.0	0.0
high temp gel breaker	0.0	0.0	0.4m ³	0.7m ³	1.2m ³
Surfactant	0.4m ³	0.4m ³	0.4m ³	0.7m ³	1.25m ³

Contingency fluid additives include (quantities to be determined during operation if required):

Alternative Salt

Delayed crosslinker

pH buffer

The additives become approved for this operation by the Environment Agency upon grant of the Permit. The Operator is not permitted to use any additive that has not already been assessed as non-hazardous and is included in the WMP.

Prior to any fluid being pumped into the well, it is subject to ultra violet (UV) treatment which eliminates the need to add biocides, as the UV treatment will inhibit bacterial growth in the well. No waste is generated by the UV treatment process.

Well test

Once all five zones have been hydraulically fractured, the well will be prepared for testing. The well is opened at each zone to reverse the flow of fracturing fluid and to allow natural gas to flow.

Nitrogen gas is pumped through coil tubing into the well, it then flows back to the surface displacing any fluid and allowing natural gas to flow into the well through the perforations and up to the surface. The purpose of this test stage is to release the natural gas from the formation and measure its flow characteristics to assist in a determination of whether the formation being tested is capable of producing commercial quantities of gas.

Once the flowback starts to produce mainly natural gas, and the flowback fluid in the flow stream steadily diminishes, the production test period will commence.

Residual flowback fluid will be separated from the gas and any solid material (sand) in the well test separator, and stored in appropriate tanks prior to removal offsite.

The Applicant will make use of the existing surface infrastructure and connect through temporary flow lines to pipework already at the KMA wellsite to transfer the gas directly to Knapton Generating Station where it can be used for electricity generation. The gas is not considered to be a waste and so will not be flared on site. Knapton Generating Station is subject to controls under a separate environmental permit.

3.3 Production Testing

Once the initial flow has been determined, a production test will run for up to 90 days as described in the WMP. The aim of this test is to determine the potential productivity of the well over a period of time. Throughout this test, further data will be gathered on the gas composition and its flow characteristics.

The results of this test will assist the Operator in making a decision on the commercial viability of moving into the production phase.

During the test phase the gas will be transferred directly to Knapton Generating Station for use in electricity generation by way of temporary pipework.

This stage of the operation will be undertaken 24 hours a day.

3.4 Production

If the Operator makes the decision that the gas flow is commercially viable, they will move to the production phase. This will involve a permanent connection of KM8 to the existing production equipment on site. If there are any changes to the WMP as a result of this decision, the Operator may need to apply to vary the permit. We will only authorise minor amendments to the WMP without the need to vary the permit.

There would be no further hydraulic fracturing during this period. Any additional fracturing would require a permit variation application to be submitted with a new WMP which would have to be assessed on its merits.

The permit is not time limited and is valid until the Operator wishes to surrender it, subject to a surrender application and approval by the Environment Agency.

3.5 Site Restoration

Once the activities have been completed, and the well has reached the end of its production cycle, the well and associated surface works will either be suspended, or plugged and decommissioned and the site reinstated to its previous use (agricultural land).

When the decision is made to close the site, the KM8 well shall be suspended, plugged and decommissioned in accordance with established procedures and the following regulatory provisions:

- the Borehole Sites and Operations Regulations 1995 (BSOR);
- the land-based requirements of the Offshore Installations and Wells (Design & Construction) Regulations 1996 (DCR);
- Petroleum Exploration and Development Licence (PEDL) PL080.

In addition, the guidance set out by the UK Onshore Operators Group (UKOOG) entitled "UK Onshore Shale Gas Well Guidance" will also be observed.

Plugging and decommissioning requires isolating different zones of the borehole with cement plugs.

Once the borehole has been properly plugged and decommissioned no further maintenance is required. However, to verify barrier construction, monitoring of the well pressure will be conducted in agreement with the Agency and HSE at the time of decommissioning. This process will follow the Oil & Gas UK and UK Onshore Operators Group guidelines, and is reviewed by an independent well examiner and the HSE.

The Operator will produce a closure plan that covers all the required measures detailed in our prevailing guidance. This current guidance is provided in section 3.4 of our guidance "How to comply with your environmental permit - additional guidance for: mining waste operations" (EPR6.14). The closure plan must be submitted as part of any application to surrender the environmental permit.

This closure plan will cross-reference the updated Site Condition Report and take into account any changes in site conditions and will include a commitment to post-well decommissioning monitoring in line with the historical operation of the site and in

accordance with regulatory/industry guidance at the time of plugging and abandonment of the well. The closure plan will also cover the reinstatement of the site to its previous use as would be required by planning permission.

The Environment Agency has the power to impose further conditions if we think that they are reasonable and necessary to ensure that we are satisfied that the well can be decommissioned and that there will be no risk of pollution or harm to human health and the permit can be safely surrendered. The Permit will remain in force until it is surrendered.

Routine ground-gas and groundwater monitoring will be required to continue post decommissioning as considered appropriate given the site history and site condition report. The frequency of monitoring will be determined based upon the information gathered throughout the operations and the requirements of the site condition report.

The decommissioning stage is sometimes referred to as well abandonment; the use of the term well abandonment at this stage is distinct to any application to surrender the permit. The permit itself cannot simply be abandoned and the obligations under it will remain until we accept that the permit can be surrendered in accordance with regulation 25 and Schedule 5, Part 1, paragraph 14 of the 2010 Regulations.

DRAFT

4. The legal framework

The mining and management of the extractive waste are regulated under different regimes. An Operator will need planning permission from the local Minerals Planning Authority, and a Petroleum Exploration and Development Licence (PEDL) from the Department of Energy and Climate Change (DECC).

The Permit is granted under regulation 13 of the Environmental Permitting (England and Wales) Regulations 2010, which regulates facilities whose activities involve water discharges and groundwater activities, radioactive substances, waste, mining waste, or which involve activities listed in Schedule 1 to the 2010 Regulations. The Environmental Permitting regime is the regulatory framework which requires the Environment Agency to deliver the obligations imposed by national policy and various EU Directives.

We consider that the Permit will ensure that the operation complies with all relevant legal requirements and that a high level of protection will be delivered for the environment and human health.

We explain how we have addressed specific statutory requirements more fully in the rest of this document.

DRAFT

5. Description of the operation

The proposed operation authorised by the Permit involves different classes of “regulated facility” as defined in the Environmental Permitting (England and Wales) Regulations 2010 (EPR). These are:

mining waste operations:

- The management of extractive waste from activities not involving a waste facility (as no waste will be stored on site for a period of more than 1 year).
- The management of extractive waste by way of a waste facility for non hazardous waste (the management of fluid retained underground), and

a groundwater activity:

- A discharge, namely the injection of fracturing fluid that might lead to an indirect input of pollutants to groundwater.

a Radioactive Substances Activity (RSR)

- A separately determined application to regulate the ways in which the radioactive material is managed, (application EPR/KB3098DE/A001).

By virtue of the 2010 Regulations, an environmental permit is required for the operation of a regulated facility.

5.1. Description of the site and related issues

5.1.1. Location

The surface site is located in an agricultural area bordered immediately by fields. The nearest habitations are Alma Farm about 230 metres to the north west and Kirby-O-Carr Farm 210 metres to the south.

The surface site is located approximately 700m south west of the village of Kirby Misperton, and about 10km from the main A64 road between York and Scarborough. The national grid reference for the centre of the site is SE 77133 79002.

The underground works, i.e. the hydraulically fractured zones, will extend approximately 378m out from the base of the well at the furthest extent. Each fracture will extend vertically about 65m above and below the point of perforation.

The site is located within flood zone 1.

5.1.2 Proposed Waste management activities

The wastes that will or may need to be managed on site are:

Waste	Classification	EWC code	~ Quantity
Well suspension brine	Non-hazardous liquid	01 05 08 chloride-containing drilling muds and wastes other than those mentioned in 01 05 05 and 01 05 06	25 m ³
Casing Clean up (after perforation)	Non-hazardous solid	20 01 40 metals	50 kg
Retained fracture fluid	Non-hazardous liquid	16 10 02 aqueous liquid wastes other than those mentioned in 16 10 01	450 m ³ to 3291 m ³
Flowback fracture fluid	Non-hazardous liquid	16 10 02 aqueous liquid wastes other than those mentioned in 16 10 01	450 m ³ to 987 m ³
Proppant (sand)	Non-hazardous solid	01 04 09 waste sand and clays	150 tonnes
Treated flowback water residue	Non-hazardous sludge	01 05 04 freshwater drilling muds and wastes	150 m ³
Milling of packers	Non-hazardous solid	20 01 40 metals	200 kg
Nitrogen	Inert	n/a	n/a

We are satisfied that extractive waste has been properly characterised in accordance with Annex II of the Mining Waste Directive.

Storage arrangements and pollution prevention measures are discussed in Sections 6.10 and 6.11.

The following section describes how the wastes arise and what will happen to them.

i) Well suspension brine

This arises during the pre-stimulation stage; a volume of brine is currently in the well which needs to be removed. Fresh water (about 94 m³) is pumped into the well to displace the brine which is collected at the surface and transferred to the onsite storage tanks. Where possible the suspension brine will be reused either at this site in the future, or by another of Third Energy's wellsite operations, (if the brine is to be re-injected, it must be into the same geological formation from which any hydrocarbons have been extracted or which for natural reasons have been designated by the Environment Agency as permanently unsuitable). If the brine cannot be reused it will be disposed of at an authorised treatment facility.

ii) Casing Clean up

This would arise during the pre-stimulation stage after perforation; clean up equipment is run into the well to scrape and remove any debris from the perforation process. The perforating guns are designed to minimise debris by reducing external burrs (steel edges) which form as the explosive charge fires through the casing.

Fresh water is circulated down the workstring and brings the debris to the surface. Water and solid scrapings are separated in a conventional shale shaker and circulating tank. The

steel scrapings are placed into a skip in preparation for removal offsite to a permitted treatment facility; where they will be assessed to determine whether they can be recycled or need to be disposed of. The separated water will be stored in tanks on site either for reuse in the process or awaiting removal off site for recovery or disposal at an appropriately permitted water treatment facility.

iii) Flowback fracture fluid

This waste arises when the flowback fluid cannot be reused, either when the flowback rates are too slow (refer section 3.2 of this document), or when the final fracture has been completed.

We are satisfied with the Applicant's proposals to minimise the overall quantity of waste arising from this process. The data gathered from the initial fracture tests assists the Operator in assessing the parameters for the main hydraulic fracturing treatment, enabling the minimum quantity of fresh water and additives to be used.

Due to the poor permeability of the Bowland Shale Formation, it is anticipated that about 30%, up to a maximum of 50%, of the injected fluid for each fracturing stage will return as flowback fluid to the surface between hydraulic fracturing stages.

The flowback fluid will contain water, sand and mineralised content from the target formation.

Where flowback fluid is re-used for hydraulic fracturing, once separated from the sand and natural gas, it will be stored at the surface in enclosed containers.

The flowback fluid will be subject to electrocoagulation treatment to remove suspended solids and iron. If the flowback fluid is suitable for reuse it will be subject to UV treatment. This is a precautionary approach to help maintain productivity of the fractures and reduce the risk of bacteria causing souring of the natural gas. UV treatment has been selected in favour of using biocides. The UV treatment does not create any further waste at the site and increases the number of times that flowback fluid can potentially be reused. The flowback fluid that can be reused will be stored in tanks on site until the next hydraulic fracture treatment takes place. Flowback fluid that will not be reused will be stored in separate tanks awaiting removal off site for disposal at an appropriately permitted water treatment facility.

No limits are required to be imposed for reuse of the flowback fluid because the mineralised content that is brought to surface with the flowback fluid has come naturally from the formation to be fractured. It will therefore have no discernible impact upon the receiving environment.

We have considered this process and we are satisfied that fracturing fluid that incorporates separated flowback fluid remains non-hazardous; which will be confirmed during testing as part of the permit's monitoring requirements.

The Permit requires that any fracturing fluid that is injected for the purpose of hydraulic

fracturing, whether it is composed of separated flowback fluid or not, must not cause pollution of groundwater and must only contain additives approved by us unless otherwise agreed in writing. We would not approve the use of any hazardous additives.

The Permit includes a requirement for the Operator to monitor the composition of the hydraulic fracturing fluid (which may include treated flowback fluid), in particular to demonstrate that no hazardous additives have been used. The monitoring results will be made available to the Environment Agency and will be available on the Public Register.

There is a prohibition on injecting fluids, other than produced water, for disposal purposes in this Permit. Flowback fluid that it is not suitable for reuse must be sent to an appropriately permitted waste facility for treatment or disposal. As part of the RSR permit application the Applicant has demonstrated that there are suitable existing permitted waste facilities that can accept and treat radioactive waste.

iv) Proppant (sand)

Sand is used as a proppant in the fracturing fluid to keep the fractures open. Some sand will return with the flowback fluid and will be separated out from the fluid in the separator. It is preferable to use fresh sand for each fracture treatment as this eliminates the need for cleaning tanks as well as equipment to re-process the proppant for re-use. Whilst this increases the proppant volumes requiring transport to the wellsite, the use of fresh sand negates additional HGV movements required to mobilise and demobilise processing equipment that would be required to treat the sand for reuse. Emissions from the use of this additional processing equipment are also a consideration, including engine emissions and noise, which are negated if the sand is not reused.

v) Treated flowback water residue

When flowback water is treated by electrocoagulation for reuse as fracture fluid a waste residue is produced. The waste (approximately 85% aqueous, 15% solid) resulting from this electrocoagulation treatment process will be stored in a tank prior to being transported off-site for disposal at a permitted waste treatment facility.

vi) Retained fracture fluid

Fracture fluid retained in the formation during the hydraulic fracture stimulation phase, is a waste and is classified as a non-hazardous mining waste facility.

Approximately 30% (maximum 50%) of the injected fluid for each fracturing stage is predicted to return as flowback fluid to the surface between hydraulic fracturing stages. We consider these predictions to be reasonable. The data gathered from the initial fracture tests assists the Operator in assessing the parameters for the main hydraulic fracturing treatment, enabling the minimum quantity of fresh water and additives to be used.

The amount of fracturing fluid used (and therefore the proportion left behind; 50% – 70%) for each fracturing event depends on the geological and physical

characteristics of the target formation.

When the injected fluid left behind in the target formation no longer serves a useful purpose it is classified as extractive waste. Retained fluid will be made up of a mixture of the injected hydraulic fluid and formation water. The Applicant has provided full details of the components of the hydraulic fluid and we are satisfied that it will be non-hazardous. We are therefore satisfied that the fluid that will be retained underground is properly classified for the purpose of the Mining Waste Directive as non-hazardous and is correctly assigned an absolute non-hazardous waste code.

Any water in the target formation will contain dissolved salts and methane. Both the Applicant and the Environment Agency have carried out assessments and we are satisfied that retained fluid will not have any of the properties that would render it hazardous under the Waste Framework Directive. Over time, the retained fluid will become indistinguishable from the formation water already in the target formation.

We have reviewed the justification for disposing of this waste by permanent deposit within the target formation as described in section 4.3.2.3 of the WMP.

The options considered were:

- Recovery of all hydraulic fracture fluid over prolonged flowback period during gas production;
- Recovery of most hydraulic fracture fluid using artificial lifting (e.g. submersible pumps);

The BAT (Best Available Technique) assessment identified that neither of the two options above would result in 100% recovery of hydraulic fracture fluid from the formation, as some fracture fluid would be absorbed into the rock.

- Recovery of hydraulic fracture fluid by excavation;

This is not considered to be feasible due to the depth of the formation within which the fluid is retained. Excavation to this depth would be required to create a mineshaft, large enough to accommodate machinery and personnel to extract the retained water. This would have more of an environmental impact than the initial proposal; generating much more waste, and having a greater visual impact, whilst prolonging the overall length of the proposal. The costs would make the whole project unviable.

- Retention of hydraulic fracture fluid within the formation being stimulated;

As the first two considerations could not achieve 100% recovery of hydraulic fracture fluid, fluid would still be retained within the formation and there would still be a non-hazardous waste facility. To minimise the environmental impact of extending the flowback period, or of installing pumps which require more energy, the retention of fluid in the formation without recovery is considered to be BAT.

We are therefore satisfied that leaving the retained fluid in situ within the Bowland Shale Formation is BAT. We have carefully considered the protection of groundwater, which is dealt with in section 7.6 below.

vii) Milling of packers

This waste arises at the well test stage; it consists of bridge plugs that will have been placed between each zone as each fracture was carried out to isolate the fracture zones from one another. These bridge plugs are temporary metal tools that are removed or milled out to open up the well at each fracture zone. The well is then fully open and ready to be flow tested.

The milling residue comprises cuttings from the metal plugs. These cuttings are separated from any fluid at the surface and stored in a skip for later removal off site to a permitted waste treatment facility. We are satisfied that there are no measures that could be employed to minimise the amount of waste generated.

viii) Nitrogen

Nitrogen has been included in the list of wastes for completeness. It is used at the final stage of the well test to displace any fluids remaining in the wellbore which may obstruct the flow of natural gas. The nitrogen used will mix with the natural gas (which contains nitrogen already) and flow with the gas to Knapton Generating Station. There is no release of nitrogen to atmosphere. The volume of nitrogen required to displace the fluids in the well will be monitored to ensure the minimum amount is used.

Well Integrity

Waste management and the protection of groundwater rely on well integrity, a properly constructed well will form an effective barrier to prevent the escape of waste, including retained fluids via the well from the mining waste facility.

Well integrity is assured through compliance with the well examination regime and regulation by the HSE, and further through conformance to Oil & Gas UK and UK Onshore Operators' Group good practice guidelines for well design and construction. An approved Hydraulic Fracture Plan (HFP) and a seismic monitoring programme will be in place prior to the hydraulic fracturing operations commencing. The Operator will also adhere to the traffic light system for monitoring of induced seismicity, which is designed to mitigate the risk from induced seismicity, including any potential for damage to well integrity.

The potential for fractures that are propagated by hydraulic fracturing to extend beyond the target formation has been assessed to be very low and the growth of fractures resulting from each fracturing stage will be assessed by DECC with the aid of the data from the seismic monitoring array.

Only substances assessed by the Environment Agency as non-hazardous to groundwater will be used as fracturing fluid additives. This is done using a methodology to determine whether a substance is hazardous or non-hazardous developed by JAGDAG (Joint Agency Groundwater Directive Advisory Group) on behalf of the WFD UKTAG (UK Technical Advisory Group).

The detailed consideration of the subsurface geology that has been undertaken as part of the Applicant's Environmental Statement has assessed the potential for retained fluids within the Bowland Shale Formation to migrate upwards into contact with any groundwater bearing formations. This outcome has been assessed as very low and with no plausible pathway (Environmental Statement; Chapter 18 and Chapter 21; and Envireau water Technical note: KM8 – Hydraulic Fracturing Operation). We are satisfied with this assessment that has been carried out, and further detail is in section 7.6.

5.1.3 Description of groundwater activity

The Permit includes the authorisation of a groundwater activity, namely the discharge of fracturing fluid into the target formation, which might lead to an indirect input of pollutants to groundwater. In section 7.6 we explain our consideration of groundwater issues.

5.1.4 Classification of the expected waste facility

A waste facility is defined as 'any area designated for the accumulation or deposit of extractive waste, whether in a solid or liquid state or in solution or suspension' for the specified time periods. The relevant one here is for 'a period of more than one year for facilities for non-hazardous non-inert waste'.

Where the fracture fluid has become waste and is then retained within the formation (as described in 5.1.2 vi), this will be an accumulation of an extractive waste for a period of more than one year, and as such is designated a mining waste facility for non-hazardous waste.

Although non-hazardous waste will be stored on site pending collection, we have included a limitation that no area should be used for the storage of waste, even on an ongoing temporary basis, for more than one year. There is no hazardous waste generated during the proposed operations. We are therefore satisfied that the only waste facility will be the retained fluid in the target formation.

As required by the Mining Waste Directive, the Applicant has provided in the WMP (sections 3.2.2 and 4.4.2), a classification of the expected waste and a justification of why the mining waste operation with a non-hazardous mining waste facility is not classified as a Category A Mining Waste Facility in accordance with the criteria in Annex III of the Mining Waste Directive.

All waste resulting from the proposed operations and managed under this Permit is deemed to be non-hazardous. Refer to the RSR Permit application (EPR/KB3098DE/A001) for details of waste containing NORM.

We are satisfied with the Applicant's conclusion in this regard.

Annex III provides that a waste facility shall be classified under Category A if:

1. a failure or incorrect operation, e.g. the collapse of a heap or the bursting of a dam, could give rise to a major accident, on the basis of a risk assessment taking into account factors such as the present or future size, the location and the environmental impact of the waste facility; or
2. it contains waste classified as hazardous under Directive 91/689/EEC above a certain threshold; or
3. it contains substances or preparations classified as dangerous under Directives 67/548/EEC or 1999/45/EC above a certain threshold.

In relation to point 1, the Applicant has assessed the non-hazardous mining waste facility against the effects resulting from loss of structural integrity or incorrect operation of the waste facility (the deposit of retained fluid within the target formation).

The Applicant has concluded, and we agree, that there is no risk of a major accident, i.e. involving significant loss of life, serious danger to human health or serious danger to the environment based on the fact that the mining waste facility is to be located more than 2km underground and will not be accessible to people, and there is no source-pathway-receptor link.

In relation to point 2, hazardous waste above the threshold, the waste fluids present in the Mining Waste Facility at closure of the Mining Waste Operation at the site may contain naturally occurring radioactive materials and other dissolved minerals salts.

With regard to the threshold referred to in the second indent of Annex III of Directive 2006/21/EC, Commission Decision 2009/337/EC provides that it is calculated as the ratio of the weight on a dry matter basis of:

- (a) all waste classified as hazardous in accordance with Directive 91/689/EEC and expected to be present in the facility at the end of the planned period of operation; and
- (b) waste expected to be present in the facility at the end of the planned period of operation.

We are satisfied that the waste has been properly characterised as non-hazardous waste.

In relation to point 3, Dangerous Substances, a waste facility is required to be classified as Category A if it contains substances or preparations classified as dangerous under Directives 67/548/EEC or 1999/45/EC above a certain threshold, which does not apply in this case.

We are therefore satisfied that this justification is appropriate and in accordance with the Mining Waste Directive, and that this operation will manage non-hazardous waste and does not constitute a Category A facility.

6. General issues

6.1. 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 Permit, in line with our Regulatory Guidance Note RGN 1: *Understanding the meaning of Operator (version 4.0)*; and that the Operator will be able to operate the regulated facility in compliance with the conditions included in the Permit.

6.2. Management

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

6.3. Financial competence and relevant convictions

We are satisfied that sufficient financial resources are available to the Operator to ensure compliance with the Permit conditions.

The Operator does not have any relevant convictions and is considered to be technically competent.

6.4. External Emergency Plan

The provisions relating to an external emergency plan do not apply as this is not a Category A facility (see section 5.1.4 for more details).

6.5. 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 occur, 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.

6.6. 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 in accordance with regulation 25 and Schedule 5, Part 1, paragraph 14 of the 2010 Regulations.

6.7. Site security and protection

The entire wellsite will have lockable gates and a perimeter fence with screening by plants and shrubs. Additional fencing will be provided around the wellhead when the site is unmanned, and a CCTV camera will also be active at this time. A roaming security detail will carry out routine checks on the wellsite.

During well operations there will be 24 hour onsite security, and strict access controls will be in force to prevent unauthorised access.

We are satisfied that the Operator will work in close co-operation with enforcement agencies to monitor and assess the risk of security to the site.

6.8. Planning Permission

Our decision on whether to grant an Environmental Permit is separate from the planning process. 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 North Yorkshire 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.

6.9. Site condition report

The Applicant submitted a site condition report detailing the condition of the site as part of their application. We use the information in a site condition report to establish a baseline for the condition of the site prior to the permitted activity starting. This baseline will be used as a comparison, to establish whether there has been any deterioration of the land as a result of the permitted activities, when the Operator applies to surrender their permit.

The Applicant provided an initial site condition report based on a desktop assessment, as they cannot start all aspects of site preparation and investigation prior to planning permission being granted. We are satisfied that this initial site condition report contains appropriate and accurate information.

However we are aware that planning permission has been given for monitoring boreholes around the site to support the baseline data gathering process.

We have specified a pre-operational condition which compels the Operator to provide the Environment Agency with a report that describes baseline groundwater quality information for the site. The report must be provided prior to the commencement of operations at the site and the information will be used to update the initial site condition report.

Further pre-operational conditions require the Operator to provide a report that details the 'as built' monitoring borehole designs, together with the observed geological strata encountered during the construction of the monitoring boreholes to demonstrate that the conceptual model has been confirmed. The agreed baseline groundwater quality sampling programme shall be implemented unless otherwise agreed, in writing, by the Environment Agency.

The results of the groundwater and surface water monitoring shall be submitted to the Environment Agency prior to any operations commencing on site.

The Operator must keep accurate records throughout the lifetime of their Permit to clearly demonstrate that their activity has not adversely affected the site. This record will be used, in conjunction with the baseline data described above and the site condition report, to support any surrender application.

6.10. Pollution prevention measures

We have considered the location of the site, and potential emissions, the sensitivity of receptors and the nature of the activity to decide what appropriate pollution prevention measures need to be in place.

As part of our assessment of the application we have carefully considered the risk assessment and all associated documents provided by the Applicant including the Environmental Statement. We consider that these cover all the potential risks and set out appropriate measures by way of mitigation.

6.11. Storage arrangements

The table below shows the storage arrangements for waste types produced on site.

Table 2 waste storage

Waste	Estimated volume	Storage type	Capacity
Well suspension brine (liquid)	25 m ³	Horizontal closed tank	1 x 70 m ³
Casing Clean up (solid)	50 kg	Open top skip	1 x skip
Retained fracture fluid (liquid)	450 m ³ to 3291 m ³	retained in formation	n/a
Flowback fracture fluid (liquid)	450 m ³ to 987 m ³	Horizontal closed tanks	15 x 70 m ³ (1050m ³)
Proppant (solid)	150 tonnes	Sealed tank	8 x 20 t (160 tonnes)
Treated flowback water residue (liquid)	150 m ³	Horizontal closed tanks	3 x 70 m ³ (210m ³)
Milling of packers (solid)	200 kg	Open top skip	1 x skip

Site construction and containment measures

Section 4.2 of the WMP provides a description of the site and how its construction has developed. KMA wellsite is made up of the original wellpad for KM1 and KM3 wells and the extension wellpad for KM8 well.

The original wellpad was levelled out and covered with a layer of low permeability clay to provide an environmental barrier between the wellsite activities and the underlying soils. A geotextile layer was placed on top of the clay barrier, upon which the site stone was laid. A drainage channel runs around the perimeter of the site which captures surface water run off and water from surrounding agricultural land, and diverts to a discharge point to Sugar Hill drain. An interceptor is located on the KM1 wellpad and captures runoff from existing operations on KM1 (the KM3 reinjection well).

The extension wellsite was constructed to the north of the original and is linked to KM1 wellpad via a ramp, as the extension lies about 4m higher. The extension site was levelled out and a perimeter ditch excavated. An impermeable membrane constructed of 1mm fully welded HDPE was installed across the site and within the ditch. A layer of geotextile lies above and below the impermeable membrane for protection.

The impermeable membrane is integrated into concrete cellars that surround the well surface equipment to ensure the integrity of the site is maintained.

Both wellpads have built in impermeable layers protecting the ground beneath them, and perimeter ditches for the collection of surface water run off, i.e. rainfall.

The KM1 and KM8 wellpads have independent surface water drainage systems. Some equipment relating to the KM8 operation will be located on the original KM1 wellpad; therefore both drainage systems have been considered.

The perimeter containment system for the KM8 wellpad will be isolated from the interceptor on KM1 during operations to ensure all surface water arising in KM8 is contained. Surface water will be reused in the operation where possible; otherwise it will be collected by tanker and removed from the KM8 wellpad. There will be no discharges to surface water.

All equipment (including that on KM1) and storage tanks will be located within temporary bunds / catchment trays with no releases to the perimeter ditches. Any spillages or water that collects in the trays will be removed by tanker for disposal offsite.

We are satisfied that the appropriate measures are in place to prevent any spills or contaminated water discharging to the local surface water courses.

Monitoring of the surrounding water courses will be carried out as described in the EMP, to ensure that the containment measures are in order and that no polluting substances reach the surface water courses. The Operator will be required by the condition 3.5.1 in the Permit to check for visible signs of pollution at the KM8 perimeter and at the interceptor.

6.12. Odour management

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

The regulated activities are not considered likely to cause odour nuisance considering the site is in a rural location, which is over 200 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.

Also see section 7.7.1 regarding fugitive emissions.

6.13. 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 rural location of the site, the distance to the nearest receptor (over 200 metres) and the level of background noise.

A noise management plan has been submitted as part of the Emissions Monitoring Plan, this has been written and assessed in line with our guidance H3 Part 2 Noise Assessment and control and we consider this plan to be suitable.

The main noise attenuation measure is an 8.7m high temporary structure around the majority of the site, forming a barrier between the activities and the nearest receptors. The use of a barrier between the source and receptor is a recognised measure in controlling noise. The potential for noise complaints is reduced further by limiting the noisier activities to daylight hours only.

We are satisfied with the noise mitigation measures proposed by the applicant insofar as they relate to the activities regulated by this Permit; the proposed abatement is considered to be BAT.

The noise management plan will form part of the Permit and the Operator must carry out the regulated activities in accordance with the approved techniques.

Condition 3.4 of the Permit covers noise and vibration.

7. Environmental Issues and their control

This section of the document explains how we have approached the critical issue of assessing the likely impact of the permitted activities on human health and the environment. It also contains details of the measures we require to ensure a high level of protection. The principal potential emissions are those to air, water and land.

The key issues arising in relation to human health and the environment during this determination were protection of conservation sites, protection of groundwater and surface water, air quality, odour, noise, contamination of land and water quality.

The detail in the sections below relate to how we determined these issues.

7.1. Assessment of environmental impacts

We are satisfied that the Applicant has properly assessed the risks posed by the proposed activities. The risks identified are set out in the Applicant's risk assessment and supporting information, which form part of the application. This covers assessments of risks to surface water, groundwater and air. We have reviewed the Applicant's assessments of the environmental risk from the operations and we are satisfied that, the risks have been adequately identified and that proper mitigation measures will be in place to comply with the requirements of the Permit.

7.2. Nature Conservation

7.2.1. Protected Sites

There are no Sites of Special Scientific Interest within 1 km of the wellsite or the furthest extent of the underground works.

There are no Special Areas of Conservation, Special Protection Areas or Ramsars within 1 km of the surface site or underground works.

7.2.2 Other sites

There are no National Nature Reserves within 200m of the surface site or underground works.

There are no Local Wildlife Sites within 200m of the surface site or underground works.

7.3 Assessment of potential impacts to surface water and groundwater

A full assessment of the application and its potential to affect local surface water features and groundwater has been carried out.

In relation to the management of extractive wastes (as part of the mining waste operation or the non-hazardous mining waste facility) we are satisfied that there are no pathways for pollutants to reach surface water or groundwater. We are also satisfied that there is no pathway for any extractive waste in the underground fractures to migrate to the surface.

Groundwater protection is discussed in more detail in section 7.6.

The containment measures as described in section 6.11 demonstrate that no spilled material will be able to leave the site and there will be no pathway for these wastes to affect land or water. The site is entirely contained and provides adequate containment for the activities.

7.4 Waste Management Plan

Under the Mining Waste Directive (Article 5) an Operator of a mining waste operation must draw up a waste management plan (WMP) for the minimisation, treatment, recovery and disposal of extractive waste. We have assessed the Applicant's WMP and associated supporting documents.

We have approved the WMP as a whole, subject to conditions in the Permit. We are satisfied that the Permit requirements, including the requirements of the WMP, will protect the environment and that Articles 4 and 5 of the Mining Waste Directive are met.

The WMP provides that the material inputs (e.g. hydraulic fracturing fluid) have been selected to minimise risk and will be restricted to the minimum amount necessary, thereby minimising the amount of waste generated. It provides an estimate of the amount of each waste that will be managed. Wastes arising from the activities will be recovered where possible. It also characterises each waste type. We are satisfied that waste is correctly characterised taking into account the definition in Article 3 of the Waste Framework Directive.

The WMP, including any associated documents, is incorporated into the Permit by means of condition 2.3.1 and table S1.2. The WMP needs to be reviewed every 5 years but in the unlikely event that the activities give rise to pollution, condition 2.3.2 enables us to require a revision of the plan to be submitted to us for approval and implemented thereafter.

7.5 Setting permit conditions

We have set conditions in the Permit in accordance with our Regulatory Guidance Series, No RGN 4 – *Setting standards for environmental protection (version 3.0)*. This guidance note explains how we determine the requirements that should apply to a particular activity. Permit conditions specify certain key measures for that type of activity to protect the environment. Other measures may be required through outcome-based conditions. Outcome based conditions specify what we want the Operator to achieve, but do not tell them how to achieve it.

We have used the relevant generic conditions from our bespoke permit template along with other, activity-specific conditions to ensure that the Permit provides the appropriate standards of environmental protection.

Our generic conditions allow us to deal with common regulatory issues in a consistent way and help us to be consistent across the different types of regulated facilities. We have included our generic conditions on fugitive emissions, odour and noise/ vibration to control emissions from the facility.

7.6 Protection of groundwater

We have reviewed the Site Condition Report, Environmental Risk Assessment and the relevant sections of the Environmental Statement submitted with the planning application to North Yorkshire County Council, against our information and conceptual understanding of the location. We are satisfied that the potential risks to groundwater have been adequately identified and addressed through mitigation measures in the Permit.

The target rocks into which the hydraulic fracturing will be carried out are in the Bowland Shale Formation and are located between 2,123m and 3,043m below ground level. Above these there are several different geological units, some of which contain groundwater.

Groundwater is defined in the Environmental Permitting Regulations 2010 (EPR) as all water that is below the surface of the ground in the saturation zone and in contact with the ground or subsoil (Regulation 2(1) EPR). Groundwater which is contained in rocks that are isolated from the surface and have no inflow or outflow, are likely to be of very poor quality with a very high mineral content due to the time they have been in contact with the rock, allowing minerals to dissolve into the water. Despite this, there are no restrictions in the regulations on the quality of the groundwater or the depth of the geological formation that contains that groundwater.

The Environment Agency has determined that the target formation, the Bowland Shale Formation does not contain groundwater because any water that is within the formation will be bound to the rock and will be relatively immobile. The Millstone Grit Formation, located directly above the Bowland Shale, between 1,625m and 1,984m below ground level, will contain groundwater. Although the Millstone Grit Formation will have a relatively low permeability due to the depth of burial, the water content is considered to meet the definition of groundwater as defined in the EPR 2010.

We have evaluated whether a Groundwater Activity Permit is required for any of the proposed activities, using the definition of groundwater activity set out in paragraph 3(1) of Schedule 22 to EPR. A groundwater activity is:

- the discharge of a pollutant that results in the direct input of that pollutant to groundwater;
- the discharge of a pollutant in circumstances that might lead to an indirect input of that pollutant to groundwater;
- any other discharge that might lead to a direct or indirect input of a pollutant to groundwater;
- an activity in respect of which a notice under Schedule 22 has taken effect;
- an activity that might lead to a discharge mentioned above where that activity is carried on as part of the operation of a regulated facility of another class.

Therefore, we have determined that a Groundwater Activity Permit is required for the hydraulic fracturing of the Bowland Shale Formation. This Permit sets out measures that will control the way non-hazardous pollutants are discharged into the Bowland Shale Formation during the fracturing process. The control measures will ensure that the non-hazardous pollutants are contained in the Bowland Shale Formation and do not enter the overlying Millstone Grit Formation where there would be potential for them to pollute groundwater.

The Millstone Grit is classed as a secondary (formally known as minor) aquifer. In the areas where it outcrops at the surface this formation can provide important drinking water resources to isolated rural communities, as well as being the headwater springs for streams.

Where the Millstone Grit Formation occurs at Kirby Misperton well site it is located between 1,625m and 1,984m below ground level, directly above the Bowland Shale Formation. The Millstone Grit at this depth does contain fluid, however this has been trapped within the rocks for many millions of years and is isolated from the fresh hydrological cycle at the surface. As there is no inflow and no discharge area from these rocks the fluids do not circulate, this means that the fluids will be very saline having had so long to dissolve the minerals from the rock matrix. It is likely that the chemical signature of water in the Millstone Grit will be similar to the chemistry of any formation water in the Bowland Shale Formation. If fracture fluid did diffuse from the Bowland Shale Formation into the Millstone Grit the impact would be insignificant due to the similarity in chemistry of the fluids.

Groundwater activity conditions

The Groundwater Activity Permit conditions are designed to ensure that activities are controlled and monitored to limit the discharge of non-hazardous substances to groundwater in the Millstone Grit Formation. We are focussing on the Millstone Grit Formation in this section, as it is the aquifer which sits directly above the Bowland Shale Formation.

The Permit contains conditions that are protective of the water environment as a whole:

- The KM8 well will be integrity tested prior to the hydraulic fracturing commencing on site. This will ensure the well is fit for purpose.
- The hydraulic fracturing fluid will only contain additives which have been assessed by us as non-hazardous, (see section 3.2 of this document).
- We have imposed a pre-operational condition which requires the operator to establish baseline groundwater quality and surface water quality. We have also imposed condition 3.5.1(b), which requires the Operator to monitor groundwater and surface water during and after the operations on site, at specific points as listed in table S3.5 in the Permit.
- The Applicant will be required to submit a Hydraulic Fracture Plan (HFP), which will need to be approved by DECC and the Environment Agency. This plan will detail the mitigation measures that are outlined in the Environmental Statement (section 18) and technical addendum on Seismicity – monitoring of subsurface. The HFP will include:
 - A map showing faults near the well and along the well path, with a summary assessment of faulting and formation stresses in the area and the risk that the operations could reactivate existing faults;
 - Information on the local background seismicity and assessment of the risk of induced seismicity;
 - Summary of the planned operations, including stages, pumping pressures and volumes, and details of the well integrity testing;
 - A comparison of proposed activity to any previous operations and relationship to historical seismicity;
 - Proposed measures to mitigate the risk of inducing an earthquake and monitoring of local seismicity during the operations; and
 - A description of proposed real-time traffic light scheme for seismicity, and proposed methods for fracture height monitoring.

In the event of suspension of activities caused by a seismic event greater than agreed in the HFP and proposed real-time traffic light scheme, this Permit requires the Operator to carry out well integrity testing of the injection borehole to confirm that the well is not damaged and that groundwater remains protected, before resuming operations.

- The Operator will be required to monitor the propagation of the fractures to ensure that the fractures remain within the target formation. We have stipulated that the Operator report the results of all testing undertaken to ensure we know this condition is being complied with. This will include reviewing data and the interpretations made of the microseismic monitoring of fracture propagation.

Details of the methodology to achieve this will be set out in the approved HFP.

None of the five fracture phases are expected, or permitted to propagate into the Millstone Grit above the target Bowland Shale Formation. The modelled results (see technical note: Envireau water KM8 – Fracture Propagation) provided by the Operator predict a fracture zone for the uppermost fracture with a length of 180m from the vertical well at KM8. Based on the model the maximum propagation upwards from shallowest fracture at about 2,126m, will be to 2,049m below ground level. The Operator concludes that even with maximum fracture height growth, the upper fracture zone will still be contained within the upper Bowland Shale Formation, the top of which is located at 1,984m below ground level.

If propagation outside the Bowland Shale Formation should occur it will be identified by the seismic monitoring and the HFP will have to be modified to minimise the risk of it happening again; for example by reducing the volume of fracture fluid being used or reducing the pressure applied.

The Permit takes account of the possibility of fracture fluid indirectly discharging into the Millstone Grit so this would not constitute a breach of the Permit but this will be controlled and mitigated against as outlined above, should it occur. As described elsewhere in this section, the impact of any indirect discharge to the Millstone Grit would be insignificant due to the chemical similarity of the fluids.

In the event of fractures leaving the target formation the fracturing fluid could discharge into the overlying Millstone Grit. The groundwater within the Millstone Grit is likely to be highly saline in a similar range to the quality of the flowback fluid, and because of this the impact on this groundwater would be negligible. Once the hydraulic fracturing pressure has been released there would be no driver to move this fluid any further and as there is no significant flow within the Millstone Grit due to the confined nature of the formation, any fracturing fluid reaching the Millstone Grit will not move far from the point of entry. The thickness of the Millstone Grit Formation is about 360m.

Other groundwater considerations are:

Other formations through which the borehole has been constructed also contain groundwater, such as the Corallian Limestone, the Sherwood Sandstone, and the Magnesian Limestone. Regardless of the water quality in these formations, the water meets the definition of groundwater in the EPR 2010 and will be protected through the mitigation measures required by the Permit.

Corallian Limestone: in areas where the Corallian Limestone Formation outcrops at, or is present close to, the surface, it has been classified as a principal aquifer and is an important source for public water supply. It is the key source of water in the area and is found in outcrop in all directions from the KM8 site, the nearest being just over 5 kilometres to the north of KM8 wellsite, where it provides the water supply for Pickering.

At KM8 the Corallian Limestone is found 189m below the ground surface, buried beneath 179m of impermeable mudstones belonging to the Amphill Clay Formation and Kimmeridge Clay Formation, which isolates the aquifer. Well integrity is key to protecting the groundwater and in order to ensure this:

- KM8 will be integrity tested prior to hydraulic fracturing commencing on site;
- and the HFP will provide information that allows us to assess the risk of groundwater pollution.

The lowest extent of the Corallian Limestone is found at 302m below ground level, which is 1,747m above the anticipated maximum fracture propagation in the Bowland Shale Formation. The Corallian Limestone will be protected through the mitigation measures required by the permit.

Sherwood Sandstone: In areas where the Sherwood Sandstone Formation outcrops at, or is present close to, the surface, it has been classified as a principal aquifer and is an important source for public water supply. The nearest abstractions from the Sherwood Sandstone Formation are located approximately 19 kilometres to the west of KM8 wellsite.

At KM8 the Sherwood Sandstone is found 1,069m below the ground surface. It is isolated from the surface and has no inflows or outflows. The groundwater is effectively static in the rock and has been confined over many thousands of years. Over this time the groundwater will have dissolved minerals from the rock and become highly mineralized, making it unfit to be used for drinking water supply. Regardless of the water quality in the Sherwood Sandstone, the water meets the definition of groundwater in the EPR 2010 and will be protected through the mitigation measures required by the Permit.

The lowest extent of the Sherwood Sandstone is found at 1,239m below ground level and this is 810m above the anticipated maximum fracture propagation in the Bowland Shale.

Magnesian Limestone: in areas where the Magnesian Limestone Formation outcrops at, or is present close to, the surface, it has been classified as a principal aquifer and is an important source for public water supply. The nearest abstractions from the Magnesian Limestone Formation are located over 40 kilometres to the west of KM8 wellsite.

At the KM8 site, the Magnesian Limestone Formation is found more than 1,239m below ground level, and its lowest extent (at 1,625m below ground level) is 424m above the anticipated maximum fracture propagation in the Bowland Shale.

The Limestone is itself a source of hydrocarbons and provides Third Energy's current source of gas. It is isolated from the surface and has no inflows or outflows. The groundwater is effectively static in the rock and has been confined over many thousands of years. Over this time the groundwater will have dissolved minerals from the rock and become highly mineralized, making it unfit to be used for drinking water supply. Regardless of the water quality in the Magnesian Limestone, the water meets the definition of groundwater in the EPR 2010 and will be protected through the mitigation measures required by the Permit.

7.7 Emissions to air

7.7.1 Fugitive Emissions:

Fugitive emissions of methane could potentially arise as it is transferred through the system of pipework. The Operator has provided a specific risk assessment for this scenario, which includes monitoring.

The Operator will carry out testing of all surface pipework to check for leaks prior to starting the operations and will be carrying out monitoring using Flame Ionization Detection monitoring equipment during the operations as part of the Emissions Monitoring Plan required by the Permit. The operations will be benchmarked against baseline levels and should elevated levels of methane be detected, the well will be shut and the cause for the changes investigated and remedied. Operation will only resume once we are satisfied that the issue has been resolved. We are satisfied that these measures minimise the risk of fugitive emissions and, together with condition 3.1, provide acceptable controls.

Baseline monitoring of ambient air will take place prior to any operations commencing, a report on the monitoring data will be submitted to the Environment Agency for review, (as a pre-operational requirement).

The Permit contains a requirement for ongoing ambient air monitoring, detailed in the Air Quality Monitoring Plan (which forms part of the Emissions Monitoring Plan). The same parameters (including methane) will be measured as for the baseline monitoring, and the monitoring will continue through the well and production testing stages and into production stage; the monitoring will continue until the data collected is indicative of the baseline air quality sample.

7.7.2 Point source emissions

An air dispersion modelling assessment has been carried out to assess the potential impact on human health and ecological receptors of point source emissions. However there are no point source emissions of pollutants from activities regulated by this Permit.

There are sources of potential pollution that will result from equipment used on site (e.g. generators, pumps), these are not regulated by this Permit and fall under the general remit of air quality as managed by the local authority.

The impacts of these emissions should however be picked up as part of the ambient air monitoring regime.

Nonetheless, our air quality experts considered the air quality assessment submitted by the applicant, and agreed with their conclusions.

7.7.3 BAT and global warming potential

This section summarises the assessment of greenhouse gas impacts which has been made in the determination of this Permit. Emissions of carbon dioxide (CO₂) and other greenhouse gases differ from those of other pollutants in that, except at gross levels, they have no localised environmental impact. Their impact is at a global level and in terms of climate change.

The Operator anticipates greenhouse gas emissions during the well operations to be about 1680 tCO₂ equivalent up to a maximum of 2602 tCO₂ accounting for uncertainty in length of project. (This refers to the whole project; not limited to the activities regulated by this Permit).

It is not anticipated that there will be any methane emitted that could not be used in power generation. Fugitive emissions of methane will be controlled as described above (section 7.7.1).

7.8 Monitoring

Condition 3.5 of the Permit will require the operator to carry out monitoring of ambient air, groundwater, surface water and certain processes.

The Permit ensures that the Operator will update the Emissions Monitoring Plan (EMP) to include reports on the baseline data collected, and for approval of the ongoing monitoring programmes, as part of pre-operational conditions prior to the start of permitted activities. This EMP will be incorporated into the Permit once approved, in table S1.2.

As mentioned in section 7.7.1, the Applicant will complete a baseline study of ambient air quality around the proposed site prior to operations commencing. Once the site is operational the Operator will continue to monitor air quality in the same locations that the baseline measurements were taken. The results of the monitoring will be made available by the Operator.

The Applicant will undertake a baseline study of groundwater and surface water quality around the proposed site prior to operations commencing. This is required by the pre-operational condition in the Permit. Once operational, the Operator will continue to monitor groundwater and surface water quality in the same locations that the baseline measurements were taken.

The frequency and duration of the monitoring will be agreed in the EMP; as a minimum requirement, monitoring will be carried out monthly prior to the activities commencing, weekly during active operations (fracturing) and then monthly thereafter.

The Operator will keep records of the data collected, which must be submitted to the Environment Agency on a regular basis.

7.9 Site stability and seismicity

Although hydraulic fracturing does involve the injection under pressure of large volumes of fluid to create fractures in the reservoir, this process will happen at depths of between 2,123 and 3,043 metres below ground.

The Operator is required by DECC to monitor seismic activity during and after fracturing and follow a “traffic light” system that controls whether injection can proceed or not, based on these checks. Any hydraulic fracturing must stop when tremors higher than the threshold agreed in the approved hydraulic fracturing plan are detected.

This level is well below what could be felt at the surface and within the range of normal background. This monitoring ensures that seismic events that may have an effect of the integrity and stability of the site are prevented.

The details of the monitoring of seismic activity are part of the hydraulic fracturing plan that the Operator is required to provide for Environment Agency approval as part of the pre-operational conditions in the Permit prior to any hydraulic fracturing starting. The approved plan must be implemented unless otherwise agreed in writing.

7.10 Other legal requirements

7.10.1 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.

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 2010 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.

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 WMP, 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 Permit

condition imposes a specific requirement, this will take precedence over anything in the WMP.

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.

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.

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.

Article 9 – Classification system for waste facilities

We are satisfied that the mining waste facility has been correctly classified.

Article 10 – Excavation voids

There is a requirement under this Article for the Operator to take appropriate measures in order to secure the stability of the extractive waste, prevent the pollution of soil, surface water and groundwater and ensure the monitoring of the extractive waste and the excavation void when placing extractive waste into excavation voids.

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

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.

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.

Article 14 – Financial Guarantee

Article 14 requires the provision of a financial guarantee in respect of a Category A or hazardous waste facility to ensure funds are available to meet the obligations of the Permit and to rehabilitate the site when operations finish.

There is no Category A or hazardous waste facility at this site, and therefore a financial guarantee is not required in accordance with Article 14 of the MWD. 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 2010 the requirements mentioned in Article 2(3) of the MWD are waived to the extent allowed by that provision. These 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.

7.10.2 Further legislation

a) Industrial Emissions Directive (IED)

This Application is not subject to the Industrial Emissions Directive.

b) Schedule 22 to the EPR 2010 – Water Framework and Groundwater Daughter Directives

To the extent that it might lead to a discharge of pollutants to groundwater (a “groundwater activity” under the EPR 2010), the Permit is subject to the requirements of Schedule 22, which delivers the requirements of EU Directives relating to pollution of groundwater. The Permit will require the taking of all necessary measures to prevent the input of any hazardous substances to groundwater, and to limit the input of non-hazardous pollutants into groundwater so as to ensure such pollutants do not cause pollution, and satisfy the requirements of paragraph 6 of Schedule 22 and Article 6(1) Groundwater Daughter Directive.

c) Directive 2003/35/EC – The Public Participation Directive

Regulation 59 of the EPR 2010 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 is being 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 draft decision in this case has been reached following a programme of extended public consultation, both on the original application and later, separately, on this draft permit and this draft 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.

d) Environment Act 1995

Section 4 Environment Act 1995 (pursuit of sustainable development)

We are required to contribute towards achieving sustainable development, as considered appropriate by Ministers and set out in guidance issued to us. The Secretary of State for Environment, Food and Rural Affairs has issued *The Environment Agency's Objectives and Contribution to Sustainable Development: Statutory Guidance (December 2002)*. That document:

“provides guidance to the Environment Agency on such matters as the formulation of approaches that the Environment Agency should take to its work, decisions about priorities for the Environment Agency and the allocation of our resources. It is not directly applicable to individual regulatory decisions of the Environment Agency.”

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.

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.

Section 6 Environment Act 1995 (conservation duties with regard to water)

Consideration has been given to our duty to promote the conservation and enhancement of the natural beauty and amenity of inland waters and the land associated with such waters, and the conservation of flora and fauna which are dependent on an aquatic environment.

We do not consider that any conditions additional to those in the Permit are required.

The Applicant has stated that mains water, obtained from Yorkshire Water, will be used during the activities so there are no direct abstraction of water issues arising from the activities engaging the Environment Agency’s duty in section 6(2) Environment Act 1995.

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 workover rig and the noise attenuation barrier. These structures are temporary in nature and any visual impact will be limited. In addition, this issue will be addressed through the planning process, for which we are statutory consultees.

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 Permit.

e) 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.

f) 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 2010, 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 Environment Agency Guidance Note RGS6 and the Environment Agency's Working with Others approach to stakeholder and community engagement.

g) Water Environment (Water Framework Directive) (England and Wales) Regulations 2003

Consideration has been given to whether any additional requirements should be imposed in terms of the Environment Agency's duty under regulation 3 to secure compliance with the requirements of the Water Framework Directive through (inter alia) environmental permits, but we consider that existing conditions are sufficient in this regard, and no other appropriate requirements have been identified.

h) 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.

i) 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 mining waste operation or groundwater activity.

j) 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.

There are no SSSIs within the relevant distance of this site.

k) The Conservation of Habitats and Species Regulations 2010

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.

There are no designated European sites (SAC / SPA / Ramsar) within the relevant distance of the site.

8. Pre-operational conditions

The draft permit contains a number of pre-operational conditions that require the Operator to carry out works, gather data and provide reports prior to certain activities starting. The Operator must have written approval from the Environment Agency prior to the specified activities starting and must implement the approved measures/procedures once they have been agreed.

The following table lists all of the pre-operational conditions and explains why we have imposed them:

Reference	Pre-operational measures	Reason
PO 1a	Prior to the operation of the regulated facility the Operator shall conduct a well integrity test on the existing borehole in accordance with section 4.3.1 of the Waste Management Plan.	To verify the integrity of the injection borehole prior to hydraulic fracturing.
PO 1b	Prior to the operation of the regulated facility the Operator shall submit a written report to the Environment Agency including the results of the integrity test carried out in accordance with PO 1a which should include, but is not limited to any comments provided by the Health & Safety Executive.	To verify the results of the well integrity test.
PO 2	Prior to the operation of the regulated facility the Operator shall submit to the Environment Agency a written Hydraulic Fracture Plan (as referred to in Waste Management Plan (WMP) section 4.3.2) and obtain the Environment Agency's written approval to the sections relevant to the permitted activities and WMP.	To ensure that the hydraulic fracturing programme has been appropriately designed and will not cause harm to the environment.
PO 3	At least 4 weeks prior to commencement of permitted activities the operator shall submit to the Environment Agency for approval an updated Emissions Monitoring Plan (EMP) which will include, but is not limited to: <ul style="list-style-type: none"> • Complete details of the baseline air quality study undertaken prior to activities commencing; and details of any changes made to the ambient air monitoring programme proposed, • Complete details of the baseline surface water and groundwater study undertaken prior to activities commencing; and details of any changes made to the surface water and groundwater monitoring programme proposed. Baseline monitoring shall include as a minimum the parameters listed in table S3.5; and the locations, depth, construction method of the monitoring boreholes. 	To ensure that an appropriate monitoring plan for air, groundwater and surface water is agreed and in place.

Table S1.3 Pre-operational measures		
Reference	Pre-operational measures	Reason
	<ul style="list-style-type: none"> • The plan shall also address the requisite surveillance requirements to monitor groundwater both pre-operation and over the lifetime of the activities authorised by this permit • Complete details of the surface water management procedures, and related process monitoring, <p>and shall obtain the Environment Agency's written approval to the updated EMP.</p>	
PO 4	<p>Prior to the operation of the regulated facility the operator shall provide a written report that provides the following information for each groundwater monitoring borehole installed:</p> <ul style="list-style-type: none"> (a) casings/linings (length, diameter, material, type of grout or filter media and whether slotted or plain); (b) depths and diameters of unlined sections; (c) records of groundwater ingress during construction and standing groundwater levels on completion; (d) details of strata encountered during drilling; (e) reference levels for the individual criteria specified in 4(a) to (c) above in metres above ordnance datum; (f) a location plan at a suitable scale showing the boreholes in relation to the point of discharge; (g) national grid references of the boreholes in the form AB 12345 67890; <p>any other information obtained from the boreholes relevant to the interpretation of water sample analysis.</p>	To verify that the boreholes have been constructed to the correct standard.
PO 5	<p>Prior to the operation of the regulated facility the Operator shall submit a written report to the Environment Agency including the details from the deep monitoring borehole (BHE) at KM8 drilled into the Corallian Limestone Formation. The report will include but is not limited to, the location of the faults and a description of how the currently used groundwater in the Corallian Limestone will be protected.</p>	To verify the impact of the monitoring borehole BHE, and how the groundwater will be protected.

Annex 1: Consultation and web publicising

Summary of responses to consultation and web publication and the way in which we have taken these into account 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 advertised on the .GOV.UK website from 10 June 2015 to 07 August 2015. Copies of the Application were placed in the Environment Agency Public Register at York and Leeds and at Malton and Pickering libraries.

The following statutory and non-statutory bodies were consulted:

- Local Authority – Ryedale District Council
- Public Health England
- Director of Public Health – North Yorkshire County Council
- Health and Safety Executive
- Mineral Planning Authority – North Yorkshire County Council
- Water Company – Yorkshire Water
- Food Standards Agency

1) **Consultation Responses from Statutory and Non-Statutory Bodies**

Responses Received from Public Health England (09/07/15) & North Yorkshire County Council – Director of Public Health (07/08/15)	
Brief summary of issues raised:	Summary of action taken / how this has been covered
<p>The main issues of concern are products of combustion (e.g. from diesel run plant on site).</p> <p>While the applicant considers point source emissions from e.g. diesel fuelled plant on site and fugitive emissions from e.g. pipe connections, it is unclear if they have considered emissions during transfer and connection operations and whether these have the potential to cause odour / nuisance to residential receptors. The Regulator should be satisfied that the applicant has fully considered all operations which may cause off site odours.</p>	<p>The environmental permit regulates the emissions from the management of the waste and the groundwater activity; it does not regulate the entirety of the activities undertaken on site.</p> <p>There are no point source emissions from processes managing the extractive waste or from the groundwater activity, but there are potential for fugitive emissions.</p> <p>However we have assessed the Air Quality Impact Assessment included within the application and conclude that the impacts to air will be low based on the modelling data and information provided. The focus is on maintaining the infrastructure to prevent leaks to prevent the release of any gases into the air.</p> <p>The system is designed as a closed loop system with none of the transfer and connection operations open to air for liquid and gas transfers. The maintenance and monitoring of such will prevent leaks that could give rise to fugitive emissions including odour. Storage tanks are sealed, but have pressure relief valves for emergency releases.</p> <p>Solid material is separated out from a contained separator unit and stored in skips awaiting removal. There is not considered to be a risk of fugitive emissions / odour from this source.</p> <p>We are satisfied that the appropriate</p>

	<p>controls are in place and that activities will be properly regulated and not cause pollution or harm to human health. See sections 6.12 and 7.7.1 of this document.</p>
<p>PHE agrees that it is important to ensure that robust environmental monitoring is conducted prior to, during and post the proposed operations such that the resident groups can be reassured that any potential impacts can be identified and investigated further. The Regulator should validate the suitability of the applicant's proposals for monitoring, so that any unexpected impact from operations will be detected and investigated promptly and results presented with comparison to relevant health based standards, where applicable.</p>	<p>Baseline monitoring will be undertaken by the applicant to determine groundwater quality and baseline ambient air. The details of this monitoring are included in the Emissions Monitoring Plan which must be approved by the Environment Agency.</p> <p>The results of the monitoring will be put on the Environment Agency's public register.</p> <p>In addition, it has been announced that the British Geological Survey (BGS) in conjunction with Public Health will carry out independent baseline monitoring for Radon.</p>
<p>The applicant proposes 5 periods of hydraulic fracturing. Different sections of their application note different durations, e.g. 3 to 4 hours, or 5 hours which may reflect e.g. different noise or emissions profiles. The Regulator should clarify the reasons for these inconsistencies in the reported durations.</p>	<p>The Applicant states that each main fracture treatment is expected to be approximately 5 hours in total per treatment, and will take place in daylight hours only.</p> <p>Each fracture treatment will be to different depths, so will take different periods of time to complete.</p> <p>The Operator has included noise attenuation measures in the application which we have assessed and consider satisfactory where it relates to activities regulated by this permit.</p> <p>Other emissions, such as those from generator use, are not regulated by this permit.</p>
<p>Based on the information contained in the application supplied to us, PHE has no significant concerns regarding the risk to the health of the local population from the installation.</p> <p>In 2014, PHE published a 'Review of the</p>	<p>We are satisfied that the Operator will operate the site in accordance with the requirements of the permit; using the operating techniques approved by the Environment Agency.</p> <p>The Operator must also act in</p>

<p>potential Public Health Impacts of Exposures to Chemical and Radioactive Pollutants as a Result of the Shale Gas Extraction Process' which concludes that: An assessment of the currently available evidence indicates that the potential risks to public health from exposure to the emissions associated with shale gas extraction will be low if the operations are properly run and regulated.</p> <p>This consultation response is based on the assumption that the permit holder will take all appropriate measures to prevent or control pollution, in accordance with the relevant sector guidance and industry best practice.</p>	<p>accordance with other regulator's requirements, such as the Planning Authority.</p>
---	--

Response Received from Yorkshire Water (07/08/15)	
Brief summary of issues raised:	Summary of action taken / how this has been covered
<p>The location of KMA isolates the well from any boreholes used for public water supply (other authorities may comment with regard to private water supply sources). Yorkshire Water use the Corallian aquifer which is exposed at the surface on the northern, western and south western sides of the Vale of Pickering. The Corallian is also present at depth in the centre of the Vale. However, the exposed and confined sections of the Corallian are physically separated from each other by significant faulting, isolating the aquifer systems and so greatly reducing the risk of contamination of the aquifer as a consequence of operations at the proposed KM8 well-site. This is supported by the good water quality of the exposed Corallian, used for the public water supply compared to the naturally poor quality in</p>	<p>No action required.</p>

<p>the confined section where the well-site is located. In addition the KM8 borehole has a number of casing strings in place to prevent leakage of fluids/gas from the well into the confined Corallian.</p>	
<p>The vertical separation of the Corallian from the Bowland Shale where hydraulic fracturing will take place is substantial, with the intervening strata providing a thick depth of low permeability rock, thus providing significant natural protection to the Corallian from the proposed operations at KM8. Data provided by Third Energy and Yorkshire Water's own data show no evidence of vertical movement of poor quality water from aquifers at depth (e.g. from within the Sherwood Sandstone) migrating vertically. Risk is further mitigated by KM8 casing and proposed well integrity monitoring and fracturing propagation modelling presented by Third Energy.</p>	<p>The Applicant has provided further information on the fracture propagation.</p> <p>No further action required.</p>
<p>Third Energy are proposing integrity testing of the borehole and fracturing propagation modelling. Assuming this is properly enforced via a condition(s) attached to the permit, should it be granted, the risk to the exposed Corallian is further reduced. Third Energy are also proposing monitoring of the groundwater aiding confidence in the risk mitigation measures, although in our view consideration should be given to monitoring the entire depth of the Corallian rather than just the top 30 metres.</p>	<p>The Operator will carry out well integrity testing at the end of the workover stage as described in the Waste Management Plan (WMP).</p> <p>Fracture propagation will be monitored and measured in accordance with the Operator's Hydraulic Fracture Plan which must be approved by DECC and the Environment Agency. This plan will also contain details of the well integrity testing. A pre-operational condition is included into the permit requiring the Operator to submit the HFP to us for approval.</p> <p>The Operator's proposals to take samples from the top 30m of the Corallian aquifer have been assessed by the Environment Agency and are found to be satisfactory, given the depth of the Corallian and its isolation from the currently used Corallian Limestone due to extensive faulting.</p>
<p>Spillage of pollutants at the surface are a risk to the surface water environment and near surface aquifers. As noted above, at</p>	<p>Surface containment has been considered in detail in the application.</p>

<p>the KM 8 site the Corallian aquifer is only present at depth and hence not at risk from surface activities. Yorkshire Water also abstract from the River Derwent which is partially fed from surface water courses in the Kirby Misperton area. However, the distance to any Yorkshire Water abstractions is significant and Third Energy have mitigation, in the form of containment and bunding, spill response and training in place. As such the risk of establishing a pollution pathway should a surface water spill occur at KM8 to any abstraction point used for the public water supply is low. We would suggest that a condition is attached to a permit that specifies in greater detail than has been provided in the application documents, the means by which storage tanks must be constructed, that they are correctly bunded (will they be individually bunded and double skinned, any alarm systems etc?).</p>	<p>The KM8 site will be isolated from the surrounding surface water environment, with each piece of equipment and storage tank stored within its own containment tray.</p> <p>Any spills or excess water due to heavy rainfall will be collected and tankered away. There are no permitted releases to surface water.</p> <p>We are satisfied that the permit provides adequate controls and the measures are in place to minimise the risk of surface spillages impacting on any public water supplies.</p> <p>The WMP is approved subject to conditions in the permit. Condition 3.2.3 of the permit requires secondary containment or appropriate measures where potentially polluting liquids are being stored.</p> <p>See sections 6.10 and 6.11 of this document for more details.</p>
<p>Given the mitigation measures required, it is Yorkshire Water's opinion that the risk to the public water supply resulting from the currently proposed operations is low.</p>	<p>No action required.</p>
<p><u>Impact on water distribution system from increased demand</u></p> <p>The anticipated water demand arising from the currently proposed operations at KM8 will not have an adverse overall effect on water resources or our ability to supply our customers.</p> <p>We would however like clarity on the total volume of water required for the operations at KM8. Paragraph 22.5.6 of the Environmental Statement states that "a total volume of 4000m³ will be required to complete the proposed hydraulic fracturing operation" whereas the hydro-geological risk assessment refers to 3,291m³ of hydraulic fracturing fluid being utilised (para 7.2). It is not clear what the rest of the water will be utilised for.</p>	<p>Fresh water is required for other stages of the process for example displacing the brine from the well during the work over stage; to circulate out the cuttings following perforation of the well casing.</p> <p>The Applicant states that 4000m³ is the maximum amount that would be required if none of the flowback fluid was suitable for reuse.</p> <p>We are satisfied that the Operator will</p>

	<p>minimise the amount of water required as this will minimise the waste produced; a requirement of the permit and the mining Waste Directive.</p>
<p><u>Induced seismicity risk to public water supply.</u> Third Energy has provided a comprehensive assessment of the seismic environment including regional and local stresses. This information indicates that the likelihood of earthquakes greater the M2.0 level of magnitude is very low. The risk will be mitigated by a regulated traffic light system and local seismic monitoring. It is Yorkshire Water's opinion that the risk of induced seismicity causing damage to water supply sources and infrastructure is very low.</p>	<p>No action required.</p>
<p><u>Disposal of waste water</u> Yorkshire Water is the statutory undertaker for waste water in the region. At present it is unclear on where any liquid waste from KM8 hydraulic fracturing operations will be treated, but we understand it will be treated on-site and/or tankered to a licensed treatment facility. We are therefore unable to comment further on this matter.</p>	<p>The destination of the waste water for treatment and disposal is not a consideration for this permit application, other than the Operator must carry out their responsibilities in line with the Duty of Care requirements, and the receiving facility has the relevant regulatory permissions.</p>

Response Received from: Health and Safety Executive (08/07/15)	
Brief summary of issues raised:	Summary of action taken / how this has been covered
<p>We have received the consultation documents relevant to this application and we would advise that from Well Operations we have no objections to the proposals.</p> <p>The well design notification and material changes for the construction of the borehole have previously been submitted by the Well Operator and inspected by a Well Operations Inspector.</p> <p>The Well Operator will submit a further well notification, with specific details of the well hydraulic stimulation (fracking) and well testing operations to be conducted, to the Executive at a later date which will also be inspected by a Specialist Well Operations Inspector</p>	<p>No action required</p>

Response Received from: Ryedale District Council (07/08/15)	
Brief summary of issues raised:	Summary of action taken / how this has been covered
<p>The consultation in relation to the above environmental permit application should be set in context with the other requirement for planning permission for this development. The National Planning Policy Framework (NPPF) sets out the context between the two regimes. Section 122 of the NPPF advise that local planning authorities should focus on whether the development itself is an acceptable use of the land, and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. Local planning authorities should assume these regimes will operate effectively. Equally, where a planning decision has</p>	<p>No action required.</p>

<p>been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.</p>	
<p>Noise It must be recognised that for a proposal such as this that some degree of noise and disturbance is inevitable, however the question is can it be mitigated to within acceptable standards. It is proposed to mitigate the impact of such development to nearby residents by design of the equipment, limiting hydraulic fracture stimulation (the noisiest of the operations) to daytime operations and by the installation of 8.7m screening barriers that have been designed to ensure the optimum mitigation. The barrier has a beneficial effect for all potential noise sensitive receptors. - In addition to the above a further way to minimise disturbance is to avoid the development over the summer months when people are more likely to utilise their gardens, visitors using the nearby campsite or sleep with their windows open. I am however aware that the environmental permit cannot control the timing of the proposed operations. A number of modelled predictions are provided for the various phases and times. The noisiest of the activities is the hydraulic fracturing operation, although the positioning of the pumps and blenders and impact of the barrier reduce the level at Kirby O Carr, the predicted level will exceed the evening SOAEL (Significant Overall Adverse Effect Level). The impact of this could be reduced if the hydraulic fracturing could be limited to daytime operations (07:00 – 19:00 hrs). There is also a slight exceedence on the night time pre stimulation workover, however this prediction is made on the basis that the rig engine will operate continually during the 1</p>	<p>See section 6.13 of this document with regards to noise.</p> <p>It is a requirement of the permit that the Operator shall take all steps to prevent or at least minimise, the impact from noise. Condition 3.4 of the permit. We are satisfied with the noise mitigation measures proposed by the Applicant insofar as they relate to the activities regulated by the permit.</p>

<p>hr assessment whereas it is likely be operating for half this period which will reduce this predicted level by a further 3dB. The applicant advises that it maybe possible at the detailed design stage to extend the partial south section of the noise barrier further west to reduce the impact to this property. This is a possibility which should be pursued.</p> <p>The Environment Agency should satisfy itself that the applicant has achieved the best practical control and mitigation that is achievable for the proposed operations and if satisfied, condition the proposed mitigation measures and levels to ensure that they stay within margins of the predicted levels.</p>	
<p>Noise</p> <p>In terms of the Noise Management Plan, and certain Action levels that are proposed, the Environment Agency may wish to give consideration to requiring amendments to these trigger levels by requiring that Action Level 1 could be notification of the site manager and Environment Agency of the initial results of each of the phases for each day within 24 hrs until the Environment Agency is satisfied that the levels are stable enough to require weekly reporting. Action Level 2 could be factored round the predicted level at Shire Grove, rather than the SOAEL levels and Action Level 3 at SOAEL. These proposed variations are not so much of an issue at night but are of significance for daytime during hydraulic fracturing and well testing when the predicted level at Shire Grove is 48_{LAEQ,1 HR} rather than an Action Level 2 of 65_{LAEQ,1 HR} as proposed.</p>	<p>We require the operator to manage the noise and vibration emitted from the regulated activities in line with their Noise Management Plan. Noise has been considered in section 6.13 of this document and we are satisfied with the measures proposed. We do not anticipate that the regulated activities will cause noise pollution and therefore do not consider that the trigger levels within the noise management plan need to be amended.</p> <p>Condition 3.4 of the permit applies.</p> <p>We can require the Operator to change the noise management plan at any time if it is found that the regulated activities are causing pollution.</p>
<p>Air Quality</p> <p>An Air Quality Impact Assessment has been undertaken to identify and quantify point sources and fugitive emissions.</p>	<p>The Air Quality Impact Assessment as provided with the WMP, and that forms Chapter 9 of the Environmental</p>

There appears to be a disparity between some of the baseline air quality figures e.g The Site Condition report Table 3.8 showing initial air quality monitoring for nitrogen dioxide provides a figure of $22.1\mu\text{g}/\text{m}^3$, whereas a more realist figure is provided in the Environmental Statement in Table 9.26 of $5.6\mu\text{g}/\text{m}^3$. The Assessment indicates that nitrogen dioxide is the predominant pollutant in relation to air quality. During the high intensity operational phases of fracturing operations for a duration (3 to 4 hours with a maximum total duration of 20 hrs), it is predicted that there could be an exceedence of air quality standards however the assessment considers the maximum process contribution for full time operation over a period of one year for each of five years meteorological conditions and the Assessment considers it unlikely that all periods of fracturing will coincide with the meteorological conditions necessary to result in the maximum process contributions. A longer term assessment of the predicted environmental concentrations of nitrogen dioxide indicates concentrations well below the air quality standard and at levels which the Environment Agency assessment criteria suggest will not significantly impact on air quality.

The Air Quality Emissions Monitoring Plan advises that for the majority of pollutants measured the samples will be collected on a fortnightly basis and then reported to Third Energy within 20 days of the collection of the sampling. It is stated that in the case of the dust deposit gauges if the level of $100\text{mg}/\text{m}^2/\text{day}^1$ in any sampling period should be exceeded for three consecutive periods from any of the monitoring stations then Third Energy will investigate the possible causes and initiate a short term monitoring programme to

Statement has been updated following requests for further information from the Applicant.

The figures used in modelling are highly conservative and designed to reflect the worst case scenario.

Please refer to section 7.7.2 of this document for further details.

Further baseline monitoring will take place and a report will be submitted to the Environment Agency, providing data regarding the baseline figure. We consider that the information we will have will be sufficient.

The monitoring regime will have to be approved prior to operations commencing. The Emissions Monitoring Plan will be required to detail the ongoing monitoring proposals including frequency.

measure PM10 levels at all locations on the site. While this maybe satisfactory for a fixed installation and long term monitoring, the delays in analysis and reporting while providing monitoring information to be compared as to what was predicted, will have no practical effect if there were some measures of mitigation that could be undertaken in the interim e.g. daily visual inspection of dust levels from the roadway to arrange for damping down. The exception to this is the proposed real time monitoring for the presence of natural gas which will be deployed at the well through fixed and portable gas detection system. If detected, gas detection equipment will provide immediate indication of the release and operational control processes can be initiated to contain any release.

The Environment Agency should consider a requirement for daily visual assessment of dust level, in relation to the prevailing weather conditions and these observations and any measures of mitigation undertaken logged.

The Environment Agency should satisfy itself as to the potential for fugitive release of natural gas and radon following hydraulic fracturing and during flow back of fracture fluids and be satisfied that these levels are within acceptable limits.

No flaring is proposed on the site and it is recommended that as proposed by the applicant that it is conditioned that all gas be piped to the Knapton generating station

The Operator will have measures in place to monitor and clean up dust emitted from the site. We will require the operator to carry out visual assessments of dust impacts from the permitted activities, and to take remedial action as necessary.

Background monitoring of radon is to be carried out independently. Monitoring for radon emissions is not a requirement under EPR 2010; it is measured insofar as it impacts on health of workforce in accordance with HSE guidelines and therefore is not within the Environment Agency's remit.

General fugitive emissions are discussed in section 7.7.1 of this document.

All gas generated as part of the well testing and production testing will be directed to Knapton Generating Station to produce electricity. This is as described in

<p>for assessment during the production testing phase.</p>	<p>the WMP which forms part of the permit. If the Operator wished to deviate from this, they would need to apply for a permit variation.</p>
<p>Water and Waste</p> <p>It is advised that 4,000m³ of water will be required to complete the proposed hydraulic fracturing operation and it is proposed to pump water from the Knapton Generating Station (KGS) to KMA via the existing pipeline ordinarily used for the transport of produced well water from KGS to KM3 water injection well. There is no information as to the pattern of water usage provided. If this is within the remit of an environmental permit, the Environment Agency should satisfy itself that the water can be supplied from KGS at such rates as to not compromise the operations at the generating station.</p> <p>There is some uncertainty as to the quantity of flow back water as the information states that all flowback water may be diverted directly to storage tanks and /or disposal of an Environment Agency facility. The Environment Agency should satisfy itself that there is sufficient storage on site for both the water requirements for the hydraulic stimulation and storage for waste water having regard to the worse case scenario as regards the anticipated flow back following hydraulic fracture stimulation operation.</p> <p>The Environment Agency should satisfy itself that adequate arrangements are in place for the transportation and final disposal of the residual flowback water.</p>	<p>The Operator will require water on site during the pre-stimulation workover and well testing phases. The availability of water at KGS is not within the remit of this application determination and is a matter for the Operator of KGS to manage. The Operator has an agreement with Yorkshire Water to supply the appropriate quantity of water as and when needed by the Operator. This is outside the remit of the environmental permit.</p> <p>The storage tanks have a capacity of 1330m³; the operator has demonstrated that should all the flowback water return to surface there is capacity to store it onsite. Although only a maximum of 50% is expected to return for each fracture treatment.</p> <p>We are satisfied that the anticipated volumes of water can be stored and managed appropriately on site.</p> <p>The residual flowback water will be tankered off site to the pre-arranged permitted waste water treatment facility.</p> <p>We are satisfied that the appropriate measures will be in place to manage this process.</p>

<p>The Environment Agency should satisfy itself as to the integrity of the existing well proposed for hydraulic fracturing and that no pathway will exist by which the proposed development could result in adverse effects on groundwater</p>	<p>The Operator will have an approved Hydraulic Fracture Plan before they can commence the fracturing treatments. This will include details of the well integrity test. The well will also be inspected by HSE (refer their comments above).</p> <p>We are satisfied that all measures will be in place to prevent an adverse effect on groundwater. See section 7.6 of this document.</p>
<p>General</p> <p>It is not clear if environmental permits relate only to the exploration phase during which the operations of mining waste and NORMS are dealt with on site. I am unsure if the retained fluids within the shale make this site a mining waste facility controlled by the environmental permit in perpetuity (the information advises it will be classed as a non-hazardous mining waste facility), or that once these operations have ceased and the waste and equipment removed that the controls of the environmental permit cease, once the site moves into the production testing phase.</p> <p>It needs to be made clear on any environmental permit the scope of the permit and what operations are controlled by the permit and at what stage the permit is surrendered.</p>	<p>See section 3 of this document which describes the scope of the proposal; from well workover to well testing and on to production if viable.</p> <p>Further detail is provided throughout this document on how we have considered the retained fluids (5.1.3 iii); the impact on groundwater (7.6), and the closure / permit surrender process (3).</p> <p>The permit covers the activities as described in the Waste Management Plan. This plan is incorporated into the permit in Table S1.2 as referenced in condition 2.3. It is a requirement of the permit that the Operator adheres to the activities described in the WMP. Any significant changes to the WMP would require a variation application to be submitted to us for determination.</p> <p>The Applicant has recognised that there is potential for extractive waste to be produced through the production testing phase and into production, if this stage takes place.</p> <p>The fluid that is injected will become waste once it no longer serves a useful purpose. The area in which the waste fluid is retained will be a mining waste facility. Over time, the retained fluid will</p>

	<p>become indistinguishable from the formation water already in the target formation</p> <p>The environmental permit controls the mining waste facility until such time as the permit is surrendered.</p>
--	---

Non Statutory bodies:

Responses to specific queries raised by Frack Free Ryedale and Friends of the Earth which are not otherwise addressed in Section 2 Public Comments

Issues raised in the application consultation	Our Response
<u>Frack Free Ryedale</u>	
<p><u>Executive summary</u></p> <p>There is insufficient detail in many parts of the application, including for example conceptualisation of local and regional groundwater conditions, potential environmental receptors, baseline monitoring, chemical usage, and waste management. The submission contains a request for further information in section 4 ('Areas Where Further Information is Sought'). The permit should not be granted until the regulator is certain of the extent of the activities to be carried out under the permit, and satisfied that risks are adequately mitigated.</p>	<p>Where we have needed more detail upon which to make our decision we have requested further information from the applicant by way of a Schedule 5 notice, and follow up questions. We are satisfied that we have sufficient relevant information upon which to make our decision. All additional information submitted in support of the Application is on our Public Register and our E-consultation tool. Further information will be provided in the Hydraulic Fracture Plan which will be submitted as part of a pre-operational condition, parts of which require approval by ourselves.</p>
<p><u>Precautionary principle statement</u></p> <p>The EA is requested to approach this permit application on a precautionary basis. This means using robust, enforceable and comprehensive permitting conditions, and avoiding reliance on assurances of operators, or management systems/plans which can change, or be overlooked. It also</p>	<p>The United Kingdom Interdepartmental Liaison Group on Risk Assessment (UK-ILGRA) state in their paper "The Precautionary Principle: Policy and Application" that the precautionary principle should be invoked when there is good reason to believe that harmful effects may occur and the level of</p>

requires scrutiny of applications to ensuring that they are sufficiently detailed and comprehensive.

Frack Free Ryedale notes that the Government has warned of funding cuts for Government funded organisations like the Environment Agency. The extent of these cuts and their timing is not known, but permits should be issued on the basis that the EA's capacity to regulate the site may be reduced from current levels. Strict and clear environmental permit conditions will assist site regulators to ensure regulatory compliance.

scientific uncertainty about the consequences or likelihood of the risk is such that the best available scientific advice cannot assess the risk with sufficient confidence to inform decision making.

The Environment Agency considers it has followed all relevant EU and UK legislation regarding the protective measures to be implemented when granting permits. In setting permit conditions for the KM8 site we have had proper regard to the potential impact the proposed activities may have on all three environmental media. We are satisfied we have sufficient information to make an informed decision and that all permit conditions are necessary and enforceable in accordance with the requirements of Defra's Core guidance to ensure regulatory compliance.

We cannot predict changes to our funding and have to determine applications and grant permits on the basis of current legislative requirements.

Assumptions

It has been difficult to comment on parts of the application because there are information gaps and a number of areas do not clearly set out the extent of the application. Assumptions have been made about the permit sought in order to comment on it.

The scope of this application (non technical summary at p10) is to hydraulically stimulate and test various geological formations, followed by the production of gas from one or more of these formations. The application does not mention any horizontal drilling and the assumption is that if granted, this

All of the assumptions stated here are correct; the proposal is covered in detail in section 3 of this decision document.

permit will not authorize any horizontal drilling. FFR has been assured by employees of the Environment Agency during the public consultation that any horizontal drilling, or fracking other than the test fracks listed in the application will require a further application to the Environment Agency, upon which there will be an opportunity for consultation. This is the basis on which FFR have approached this consultation exercise.

The production phase referred to in this application is not defined by the applicant, and the duration of the production phase is not assigned a timescale, other than production testing for up to 90 days (para 4.3.3 non technical summary). The application suggests (para 4.3.4 Waste Management Plan) that after production test phase KM8 will be permanently hooked up to production equipment on site after which 'longer term production of natural gas will commence'. It is not stated whether this is from the five test fracks, or from some other activity. In reliance on assurances from EA staff during consultation meetings and discussions;

- FFR understands the term 'production' in this application as meaning the period of time during which gas is produced from the five test fracks (and any pre fracks) detailed in this environmental permit application, and from no other sources or activities.
- Any horizontal drilling will require a further environmental permit, and any production from these sources will be dealt with during that application process.

The Operator *may* go into production if the production test demonstrates that the well will be commercially viable from these five fractures as described in the WMP and in section 3 of this document.

<ul style="list-style-type: none"> • No drilling or hydraulic fracturing at KM8 will be authorized by this environmental permit, other than the five test fracks and associated pre-frack tests. • If this is not correct, please can the applicant or the EA explain the extent of the application and FFR will seek further time to consider these aspects of the application. <p>If the applicant is unable, for any reason, to transfer any gas produced to the Knapton Generating Station, it will not be allowed to flare gas at this site without making a further application.</p>	<p>No flaring can take place without a successful variation to the permit taking place.</p>
<p><u>Areas where further information is sought</u></p> <p>The Hydrogeological Risk Assessment accompanying the permit application is a very limited document which does not provide sufficient confidence that risks to groundwater associated with the proposed development will be at an acceptably low level. Further conceptualisation of the groundwater system underneath the site should be presented in order to inform the assessment. (See JBA report at Appendix 1)</p> <p>Groundwater and surface water trigger levels are not presented against which the significance of a future pollution incident can be assessed, or mitigated against. Details on trigger levels for intervention, or mitigation should be given, in regards to human and ecological health. (See JBA report at Appendix 1)</p> <p>Well testing</p>	<p>The Site Condition Report contains a conceptual model; and where we needed further information in relation to the Hydrogeological Risk Assessment this was requested in the Schedule 5 notice.</p> <p>We are satisfied that we have enough detail of the groundwater system upon which to base our decision. In addition, further information will be provided in the Hydraulic Fracture Plan which will be submitted as part of a pre-operational condition, parts of which require approval by ourselves.</p> <p>The quality of groundwater varies so assessment against DWS or a trigger level is not necessarily meaningful; whereas comparison with the baseline gives a better indication of any deterioration.</p>

There is no information on the frequency of testing of well casing integrity following the prestimulation work over. What type and frequency of testing of well integrity will take place? The failure of well casing integrity is identified by many commentators as one of the most significant risks of pollution to groundwater, and seismic activity.

Storage of explosives

Storage of explosives- there is currently no detail on where and how explosives will be stored on site, and what measures will be taken to protect the environment, and safeguard the public.

Waste management

The Waste Management Plan does not provide sufficient technical detail on how waste will be transferred on site, and measures to mitigate risks during transfer.

Who will be the person in overall responsibility for waste management (is this the Site

Supervisor- see para 5.3.3 Waste Management Plan) and what will be the minimum waste qualifications held by this individual?

Well integrity is checked after the pre-stimulation stage and before any hydraulic fracturing treatments take place; the results are reported to HSE and will be submitted to the Environment Agency as required by a pre-operational condition. The well will be maintained to appropriate standards throughout operations in accordance with HSE guidelines.

The Hydraulic Fracture Plan will provide more detail on how seismicity will be monitored.

The storage and use of explosives does not fall under the remit of the environmental permit. HSE legislation will apply which the Operator must adhere to.

Transfers of fluids will take place within a contained system through sealed pipework. All equipment sits within its own bund, and drip trays will be used for transferring or decanting materials. We consider the waste management plan provides sufficient technical detail on how waste is transferred on site and the precautionary measures required during this process.

Appendix 3 of the WMP details the roles and responsibilities of the Third Energy employees. The operation of a non-hazardous mining waste facility does not require compliance with a particular waste handling scheme, such as CIWM / WAMITAB.

The experience and training for each member of staff is set out in the management system which is a

	<p>requirement of condition 1.1 of the permit, and as described in section 5.3.4 of the WMP.</p> <p>Operator competence in this context will continue to be considered throughout the life of the permit.</p>
<p>The Third Energy Station Manager is listed as being responsible for registering sites as hazardous waste production sites (Waste Management Plan, Appendix 3, page 68). This application does not state whether this site will be registered as a place of production of hazardous waste. If it is, it does not contain detailed mitigation measures to deal with and minimize pollution from hazardous waste?</p>	<p>There is no intention to produce hazardous waste or to register KM8 as a place of production of hazardous waste.</p>
<p>The Station Manager is listed as being responsible for training on waste management (Waste Management Plan, Appendix 3, page 68). What qualifications will this post holder have?</p>	<p>See above, regarding operator competence.</p>
<p>There is no mention in Appendix 3 of who will be site lead to assist the Radiation Protection Advisor and the Radioactive Waste Advisor.</p>	<p>Refer to RSR permit application EPR/KB3098DE/A001.</p>
<p>Waste codes are given in the application. What steps are in place to ensure that the waste is correctly coded before it is removed from site, given there are variables such as NORM etc that are not known at the outset?</p>	<p>The Operator has a Duty of Care to ensure the waste is correctly described prior to it being removed off site. (There is a Duty of Care code of practice which applies to all parties involved in the transfer of waste. Adherence to these procedures is checked during regulatory inspections of all permit holders.) Refer to RSR permit application EPR/KB3098DE/A001 for issues relating to NORM.</p>
<p>There is insufficient technical detail in the</p>	<p>Additional information was provided in an</p>

Waste Management Plan on matters including;

- Construction of storage containers
- On site fluid transfer procedures
- Steps to mitigate pollution off site, for example mud on roads.

updated WMP regarding the storage containers which will be sealed and hydrostatically tested following construction, with routine testing for defects as part of the ongoing monitoring scheme.

Transfers of fluids will take place either within a contained system through sealed pipework or to / from tanks located on drip trays. All equipment sits within its own bund, and drip trays will be used for transferring or decanting materials. Wheel wash facilities will be available at the site and the roads to and from the site will be monitored for mud deposits. A road sweeping contractor has been arranged for road cleaning as required.

Baseline Monitoring

What base line monitoring has been done to date at this site as part of the previous activities at KM8?

The final baseline monitoring report will be submitted to the Environment Agency prior to operations commencing; this will include ambient air data, and groundwater and surface water monitoring. Some baseline data has been provided in the EMP. The final EMP will have to be approved as required by a pre-operational condition.

Risk of Water Pollution (to be read in conjunction with JBA Report at Appendix 1)

The applicant is proposing to treat waste water on site, for re-use. The applicant cannot rule out that the flow back fluid may be contaminated with NORM (page 14 non technical summary, Studvik Report, para 3), and has sought an environmental permit to manage and dispose of NORM. This application does not sufficiently particularise the steps that the applicant will take to mitigate the risks of this material to groundwater, surface water and inland freshwater in

For NORM issues refer to the permit application: EPR/KB3098DE/A001.

the event of spills, human error or mechanical failure on site given:

- Pathways from the site to Costa Beck, Ackland Beck and the River Rye
- The perimeter ditches are backfilled with stone (non technical summary page 17) and therefore of reduced capacity.
- The importance of the area for agricultural use and food production, including designation of a Food Enterprise Zone (FEZ) in Ryedale
- The absence of any drainage systems or public/private sewers from site

The site was developed initially in 1984 and the clay liner and impermeable membrane is now over thirty years old. Works on the 2013 Kirby Misperton 1 extension added an impermeable membrane which the applicant states was tested during installation (non technical summary p16).

- What testing has been carried out of the adjacent KM1 site to ensure it remains impermeable?
- What risk does the KM1 site pose to groundwater due to activities planned throughout both sites, for example traffic movements, access, difference in site heights and operations?
- The drainage of each part of the site (KM1 and KM8) work independently of each other (para

Where activities relating to KM8 well gas extraction are taking place on KM1, e.g. storage; each tank is individually bunded and self contained. The existing impermeable membrane is not being relied on as the only method of containment.

There is no pathway for surface activities to impact on groundwater.

See section 6.11 of this document for a full description of the drainage arrangements on site.

4.2.1 waste management plan). KM1 is lower than KM1 extension/KM8 and connected by a ramp. The KM1 site drainage does not contain on site liquids. There do not appear to be any mitigation measures to ensure that the site is managed as a whole in the event of a potential pollution event. The risks of pollution have not been correctly identified by the applicant.

There is insufficient information and/or mitigation measures to mitigate the risks of spills and contaminants to ground water and adjacent surface waters.

Water run off rates have not been supplied by the applicant.

Will the operator test for methane in flow back fluid?

Has applicant identified and risk assessed groundwater dependent wetlands in the area?

The environmental risk assessment includes details of how spillages will be reduced or avoided and how the risks from potential spillages are going to be minimised. The extractive waste transfer and storage activities will take place on an impermeable surface with individual containment around tanks. Spills direct to surface water will be prevented by the site drainage system.

Section 3.8 of the Site Condition Report details the runoff rates used in determining the land drainage requirements.

Methane is the main constituent of the natural gas being extracted; efficient use of the separator at the surface will ensure as much of the gas will be removed as possible, any flowback fluid that is not reused will be tested by the receiving waste treatment facility to determine the recovery or disposal options.

The Operator has not considered these specifically, as there will be no abstraction from local groundwater sources, and no depletion of existing groundwater supplies. We are satisfied

Has applicant sufficiently demonstrated there is no risk to private water supplies? Some potential private water supplies have not been ruled out.

Risk of Pollution to Land and Air

The Risk Management System does not contain any detail. The Knapton Generating Station Environmental Management System is a broad level guidance document without specific policies or procedures. Key documents are referred to but not included. There are no corresponding detailed documents submitted for the KM8 site.

What are specific noise mitigation measures around noise and vibration? In particular will there be conditions requiring minimum standards of sound barriers, or will this be left to the applicant (the application suggests a stack of containers)?

Appendix 5 of the Permit Application ("Geotechnical Evaluation of Site Condition") identifies historical contamination in the form of heavy metals in shallow soils. Measures to mitigate the impact of this contamination source on the surrounding environment, nearby residents and site operatives should be given. In addition, the impact

that there will be no impact on groundwater dependent wetlands from the permitted activities.

There are no recorded private water supplies within a 2km radius of the KMA wellsite. The Operator acknowledges that there may be unrecorded private water supplies within that area and has identified possible locations. Private water supplies target the shallow formations; as described in section 7.6 of this document we are satisfied that the fractures would not propagate through the layers to reach the shallow water bearing formations.

A permit application requires a summary of an applicant's environment Management System (EMS); the summary EMS received covers the Generating Station and all associated wells including KM8. The EMS will be assessed throughout the life of the permit as part of the ongoing compliance checks.

The noise mitigation measures proposed by the applicant are considered to be BAT; refer to section 6.13 of this document and condition 3.4 of the permit refers to noise insofar as it related to activities regulated by this permit.

The well has already been drilled and there are no further ground works proposed by this application that would impact on the shallow soils.

of the proposed development in terms of its potential to mobilise historical contamination should also be assessed.

It is proposed to do baseline testing of environmental media for background concentrations of radionuclides, followed by a contamination monitoring programme (Studsvik, para 7.2). A baseline Radiological Site Condition Report will also be obtained (Studsvik para 7.6). It does not specify what will be tested for, which media, over what period will base line testing take place, and the methodology for that testing. Will it include radon, and if so, where will radon testing be carried out? There is no mention of measurement of Radon, other than theoretical exposure testing (Studvik external memo).

There is no detail on testing once the site has ceased production.

Chemical use, air quality and storage

4.24 The Chemicals Inventory (Appendix 4, p.72) lists three completion fluid chemicals ('Safe-side', a triazine based biocide with hazard code H330 - 'fatal if inhaled'; 'Safe-core EN', a formaldehyde based corrosion inhibitor which contains a teratogen; 'Safe-Scav NA' which contains ammonium bisulfate and is a suspected carcinogen). These chemicals are not referred to anywhere else in the document.

- Are these chemicals to be used in this activity, or are solely residual from the well drilling in 2013?
- For each of these chemicals, the same numerical value has been

Refer to the RSR permit application: EPR/KB3098DE/A001.

The Chemical Inventory (Appendix 4 of the WMP) identifies all chemicals on site for monitoring and compliance purposes. This list includes substances that may have been present on site previously.

Further clarification on Appendix 4 and Appendix 5 of the WMP were provided as Technical Note TE-KM8-TN-EPR-SCH5-HFF in response to a Schedule 5 request.

The tables in Appendix 5 include the chemicals to be used for the hydraulic fracturing treatment.

The three chemicals referred to are expressed in kg and litres. The max

given in the 'total weight' (assumed to be Kg) and the 'max tonnes' column of the Chemicals Inventory. Which is the correct amount?

- It is presumed that these chemicals are a constituent of the Well Suspension Brine at an unspecified concentration. As these chemicals are not included in the JAGDAG assessment (Hydraulic fracture fluids, ref. TE-EPR-KM8-HFS-HFF-08, p.2), what is the justification for stating the Well Suspension Brine is "non-hazardous" (Table 5.3.1, p.33)?
- Will further use of these chemicals be required in subsequent activities (i.e. well abandonment) not covered by the current permit application, if the hydraulic fracture stimulation goes ahead?

Does the information in the Chemical Inventory adequately address the risks posed by the individual chemicals reacting with other chemicals or substances on site to alter their composition?

It is suggested that "UV treatment eliminates the need for biocides" (p.20), but later says that UV treatment will "significantly reduce or eliminate the volume of biocides used" (Appendix 6, p.77). Clarification is required regarding whether or not biocides will be used.

tonnes column would appear to be incorrect, and has been clarified with the applicant and an updated Appendix 4 has been received.

As these chemicals are under the heading of completion fluid additives, they may be present in the well suspension brine. The JADAG assessment refers to chemicals that have been assessed as non-hazardous for possible injection into the well as part of the hydraulic fracture stimulation. The well suspension brine is already in the enclosed well and has been classified as non-hazardous by the Applicant (Refer WMP section 5.3).

Proposals for closing the site and well abandonment will be covered in the site closure plan as described in the WMP. Any changes to the chemicals the Operator may want to use in future will require a change to the WMP, and a variation of the permit.

The Chemicals Inventory identifies all chemicals on site for monitoring and compliance purposes. This list includes substances that may have been present on site previously. We are satisfied that all chemicals will be stored appropriately and no unintentional reactions will take place.

In accordance with the statement in the WMP, the Operator does not propose to use biocides. The document in Appendix 6 of the WMP is the manufacturer's outline of how the UV treatment process works.

The solid waste (sludge) generated by the electrocoagulation treatment is described as "nonhazardous" (p.23, Table 5.6 p.37) but no information is given regarding its expected composition.

Has the possibility of by-product formation during waste treatment been considered? (e.g. Organohalogen compounds formed by the chlorination of waste waters containing high levels of halide ions).

It is stated that "The hydraulic fracture treatment will be conducted during daylight hours only, however, preparation times, including rigging up and rigging down the equipment, extends the overall duration of the hydraulic fracturing and well test phase to approximately six (6) weeks" (p.20). During the fracking stage, other activities will take place on site outside of daylight hours? If so, the times that activity will take place should be specified in a permit condition.

The Air Quality Assessment uses meteorological data from Leconfield station, which is about 20 miles from Kirby Misperton (p.12). Can it be demonstrated that the wind fields at Leconfield are representative of those at Kirby Misperton?

Some of the chemicals in the Halliburton chemical safety data sheets are listed as 'assumed yes' as to whether they are approved by the Environment Agency. Some are listed as harmful, if not hazardous. Have all chemicals been approved for use by the Environment

Further information was requested of the Applicant in this regard, and is available on our Public Register and E-Consultation website. The solid waste will comprise the suspended solids and some iron.

Waste treatment on site is limited to electrocoagulation treatment. The waste resulting from this process has been assessed as non-hazardous. The receiving waste facility will carry out an independent assessment of the waste and treat it in an appropriate way.

The Operator will carry out the activities as described in the WMP, in a manner that will prevent pollution or annoyance as required by the permit conditions. We do not consider it necessary to separately specify operational hours within the permit when they are described in the WMP.

For the purposes of the air quality dispersion model, the meteorological data used is considered to be satisfactory.

Further information was requested of the Applicant in this regard and is available on the Public Register and E-consultation website. Refer Technical Note TE-KM8-TN-EPR-SCH5-HFF in response to the Schedule 5 request. The chemicals have been assessed in

Agency and are the on-site storage and handling procedures sufficiently detailed?

terms of their non-hazardous status to groundwater; the chemicals are not approved for use until such time that a permit is granted, if that is the final decision.

We are satisfied that the chemicals will be stored and handled in an appropriate manner.

Frac Sand Safety Data Sheet refers to dangers as H350i 'may cause cancer by inhalation' and H372 'causes damage to organs through prolonged or repeated exposure'. What assurances are there to residents that the use and exposure to this and other chemicals, especially where the site is no longer in use, the applicant is not present, and future generations are exposed to chemicals on the site or migrating in groundwater?

Sand used as a proppant will be either retained in the underground formation or removed from site once the fracturing processes are complete. There will be no sand remaining on site.

Potential emissions arising from on-site treatment of the raw gas, including phase separation and liquid storage on site if the gas is wet (p.28 Waste Management Plan) do not appear to have been considered. The well test separator (Waste Management Plan p.21, 26, 27) is presumed to use Monoethylene glycol and methanol (Waste Management Plan, Appendix 4, p.72). What emissions are likely to arise from these processes and why have they not been included in the Air Quality Assessment?

The transfer and separation of gas will take place in enclosed systems, with liquid separated out and stored in sealed tanks awaiting removal off site.

We do not expect there to be any point source emissions, (none will be permitted), and fugitive emissions will be covered by condition 3.2 of the permit.

The potential for dust generation arising from the use of Frac sand and mesh sand (316.5 and 4.8 tonnes respectively; Chemicals Inventory, Waste Management Plan p. 73) is not included in the assessment of PM10 levels. Meanwhile, the use of frisbee gauges to record dust deposition is included within the Emissions Monitoring Plan (TE-Epra-KM8-HFS-EMP-09).

We do not expect sand to impact on air quality; we are satisfied that the sand will be contained and will not cause a pollution issue. Sand is transferred into silos using the high walls as a windbreak, the silos are connected to the blender through a system of enclosed pipework.

The returning sand will be wet, and stored in sealed containers prior to

What are the predicted impacts on air quality arising from the use of proppant sand?

No details are given regarding the handling of the fracture fluid additives, including the proppant sand. How will the fracture fluid be mixed, and what measures will be taken to minimise the risk of spillages and emissions, including dust formation, during this process?

It is stated that "If dust deposition results exceed 100 mg.m-2day-1 in any sampling period the sample will be examined by Scanning Electron Microscopy....." (p.9). Frisbee gauges will only record mean rate of dust deposition over the sampling period, here taken to be two weeks (length of time between ESG visits). Therefore it is possible that dust deposition may exceed 100 mg m-2 d-1 on some days, without this being detected by the proposed monitoring technique. It is unsatisfactory that further investigation will only be instigated if mean rate of dust deposition exceeds the threshold given, if this is what is proposed.

In the event of dust deposition "exceedances for three consecutive periods" (presumed to be six weeks, plus up to 20 days for return of results (p.12)) Third Energy will "investigate the possible causes and initiate a short term monitoring programme to measure PM10 levels at all locations on site" (p.9). The duration of each of the described activities is typically 6 weeks or less (e.g. six weeks for hydraulic fracturing and well test phase, p.20 Waste management Plan).

- What is the anticipated duration of this further monitoring?

removal off site.

The sand silo is connected to the blender via enclosed pipework, the additives will be handled in accordance with the relevant safety data sheets and transferred to the blender contained by a bund.

The Emissions Monitoring Plan (EMP) will be updated and submitted for approval as part of a pre-operational condition. Monitoring techniques and frequencies will be considered and approved before operations commence.

- Given the timescales involved, is the further monitoring likely to take place during periods of similar on-site activity to those that taking place during the periods of exceedance?
- Carbon dioxide and methane are to be monitored using grab samples (p.9). What sampling protocols will be used to avoid any sampling bias when collecting these samples?
- Sulfur hexafluoride (SF6) is included in the list of substances to be monitored (p.8) but is not considered to be significant for the assessment of greenhouse gas emissions (Air Quality Impact Assessment, p.27). Why is it being monitored?

As described in the EMP.

This compound was identified within the initial baseline monitoring, at less than 0.15 ug/m³; it is not proposed to monitor this further as the levels are insignificant. We are satisfied with this approach.

Public Health

The demographics of Ryedale include a significant proportion of elderly residents, and also families with young children. During peak and holiday periods it is a popular destination for family visitors, who are attracted by Flamingoland and the adjacent holiday village, both of which are close to the KM8 wellsite. Both the elderly and young are potentially vulnerable receptors in close proximity to the well site, but this does not appear to have been given sufficient weight in this application.

The health impacts are considered for the whole population rather than specific groups. The Environment Agency's assessment of the risks to human health is based on the potential pollution and emissions that could result from the permitted activities rather than on specific health issues. This is the remit of Public Health England who were consulted as part of the determination process.

Public Health England has advised that based on the information provided in the application they have no significant concerns regarding the risk to health of the local population.

The key health pathways identified and assessed by Third Energy are air quality, lighting, noise, seismicity, socioeconomics, traffic and transport and

Baseline monitoring for the permitted activities is being undertaken for air quality, noise, surface water and groundwater. The results of the baseline

water. The baseline conditions will be taken from these key health pathways in order to monitor public health of the Ryedale area.

- What is the duration of baseline monitoring for air and water quality? It should take into consideration seasonal fluctuations.
- How will this baseline condition or any changes to it affect public health and vulnerable populations such as the young and older populations, those with cardiorespiratory diseases and others?
- Baseline monitoring of water quality of the surrounding areas should consider a wider range of potential contaminants such as NORMS. Further information is found in the JBA Hydrogeological Risk Assessment review (Appendix 1).

How does the population health profile of the North Yorkshire area define and influence trigger and action levels of the health sensitive receptors?

How have particularly sensitive groups of receptors been identified and assessed beyond desktop research informed by the Annual Report (2014) published by the Director of Public Health at North Yorkshire County Council and Public Health Observatory Data maintained by Public Health England?

- Detailed health impact survey and community health audit is suggested in order to be able to detect events leading to

monitoring will be submitted as a requirement of a pre-operational condition.

The Emissions Monitoring Plan will contain the details of the methodology frequency, duration and reporting of each type of monitoring.

Under the environmental legislation we have a duty to consider public health in terms of pollutants emitted from a regulated activity; the Environment Agency does not consider population health profiles.

A health impact assessment has to be initiated by the Planning Authority.

<p>fluctuations of health and well-being.</p> <p>What ongoing monitoring of public health locally is proposed?</p> <ul style="list-style-type: none"> Other applications have considered the perception effects of hydraulic fracturing that could affect mental, physical and emotional well-being. Will and how will this be monitored? <p>In the event of changes in health patterns emerging during monitoring what interventions would be planned?</p>	<p>The monitoring of public health is outside of the remit of the Environment Agency. We consider pollutants and emissions which could impact on human health from the regulated activities. The monitoring requirements will be set out in the Emissions Monitoring Plan.</p> <p>Public Health England have raised no objection and we are satisfied that the activities we are permitting will not give rise to any significant pollution or any emissions that will cause harm to human health.</p>
<p><u>Submissions on risks to ground and surface water</u></p> <p>The JBA Hydrogeological Risk Assessment review (Appendix 1) is to be read as part of this submission. It is not quoted in the body of this submission in the interests of brevity.</p> <p>The report concludes, 'in our opinion, the conceptualisation of the local groundwater system beneath the site is lacking sufficient detail in order to conclude that risks to groundwater and surface water receptors associated within the proposed development are very low as suggested'.</p> <p>The JBA review also concludes 'the site as presented in the permit will be unable to provide sufficient permanent containment around the wellpad to prevent discharge of contaminated runoff into the surrounding surface water system following an accident, or an incident on site'.</p>	<p>We are satisfied that the Applicant's hydrogeological risk assessment and the conceptual understanding have demonstrated that the activity is environmentally acceptable.</p> <p>Section 9 of the WMP describes the measures the Operator would take in the event of an incident; in addition to the site containment infrastructure in place, there will be additional containment measures provided by an onsite incident response unit.</p> <p>We are satisfied that the Operator will have the appropriate measures in place to minimise the impact of any incidents; and that we have sufficient information to address the bullet points listed below.</p> <p>See section 6.11 of this document for a full description of the drainage arrangements.</p>

The Kirby Misperton wellsite has a perimeter drainage channel for surface water runoff from adjacent land (para 4.2.1 non-technical summary, para 4.2.1 Waste Management Plan) to a discharge point into Sugar Hill Drain. Production equipment on site is individually bunded and connected to an interceptor which discharges into Sugar Hill Drain.

- There is no detail on the capacity of bunding on site.
- There is no reference to any capacities of perimeter containment of liquids on site, and no reference to interceptors or spill containment which can deal with the quantities of fluids to be used on site. Permit conditions should specify minimum capacities.
- In paragraph 4.2.1 of the non technical summary, spills are contained by isolating the perimeter drains from the interceptor and thereby reducing the capacity of the site to deal with spills.
- Three sides of the 'containment ditch' have been backfilled with stone and a perforated plastic pipe, which will reduce the capacity of the drain to contain spills (Waste Management Plan)
- There is no information on how site/surface water is collected.
- There are no mitigation measures for what is widely recognized as one of the highest risks for pollution (on site surface activities). The site requires suitable mitigation measures to both capture and contain spills on site, including fire water, flow back fluid,

- chemicals, fuel and tankered liquids.

The applicant suggest that any on site spills will be contained on site
The purpose of the impermeable membrane is to capture any surface run off liquids such as rainwater, but captures any spillages incurred onsite and contains them within the site perimeter ditches, ensuring environmental harm is averted and any spillages can be rectified onsite (Waste Management Plan 4.2.1).

The capacity of the entire perimeter drain has been calculated as 135m³ see report of JBA Consulting Limited at Appendix 1). In the event of a major spill, or fire, the site does not have the capacity to contain fluid and they will end up in the Sugar Hill Drain and beyond.
Permit conditions should prevent this occurrence.

It is suggested (paragraph 9.3 Non Technical Summary, and Site Safety Document) that fire water will be contained by the impermeable membrane, but this does not take into account the volume of fire water generated by an incident, the tiered nature of this site, and the sensitive watercourse and ecosystems nearby which need to be protected. The suggestion that the containment ditch (part of which is linked to the Sugar Hill Beck) will contain firewater is disingenuous.

The lower (older) part of the site is constructed so the ditches catch off-site run off and divert it around the site. They are wholly inappropriate to contain site generated liquids. There is no way to

The on-site incident response trailer contains equipment for containing any spillages prior to them reaching the ditch system, which would include fire water.

The KM8 (upper) area can be isolated from the drainage ditches that lead to the Sugar Hill Beck discharge.

We are satisfied that the Operator will have the appropriate measures in place to deal with volumes of on site fluids.

<p>isolate the lower part of the site, due to the construction of the ramp. The permit should not be granted until the site can contain 110% of the potential on site fluids (for example flow back water).</p>	
<p><u>Permit conditions/restrictions sought</u></p> <p>Robust permit conditions</p> <p>Due to the often quite vague and general information in the permit application, if a permit is granted, the EA should include enforceable, robust permit conditions regulating and restricting all activities which have the potential to impact on the environment or human health. These matters should not be left to a management plan for the following reasons:</p> <ul style="list-style-type: none"> • Precautionary principle is relevant to fracking in the UK • There is a degree of uncertainty around the process • A management plan can be easily amended without open consultation • There is a high degree of interest and concern from local residents, who seek safeguards and protection • Clear permit conditions are the most open and transparent way of regulating the site • The permit may be transferred to a third party in the future. <p>Conditions which sanctioning noise, odour or nuisance where ‘all practicable steps have been taken’, or where ‘best available techniques’ are used will not give residents and the environment the required degree of protection or confidence.</p>	<p>Any permit conditions will be drafted so as to comply with the Environment Agency RGN 4 guidance, <i>Setting Standards for environmental protection</i>.</p> <p>As described in the Mining Waste Directive, the Waste Management Plan is the principal document for the management of extractive waste. The grant of a permit represents the approval of the WMP, subject to conditions of the permit and the operator is required to comply with all procedures and techniques described in the WMP subject to permit conditions which also impose additional requirements.</p> <p>The Operator must make an application to vary the permit if they wish to make a significant change to the WMP. In the event the Operator wishes to make a minor change to the WMP, condition 4.3.5 of the permit requires them to get prior agreement from the Environment Agency.</p> <p>The odour and noise conditions are standard conditions for any activity permitted under EPR 2010 and form part of the permit requirements. The documents incorporated in to the permit by condition 2.3.1 and listed in table S1.2 describe the techniques the</p>

Include an environmental permit condition requiring written consent from the Environment Agency before changes to the management plan or operating procedures shall take effect (para 10 Non technical summary)

Specifications for tanks and storage containers should be the subject of permit conditions rather than part of a management plan. These should also be supplied with the permit application rather than supplied after it has been granted.

Extent of permitted activities

Include a permit condition restricting the applicant to five test fracks, and associated pre-fracks, and only production of gas generated from those fracks.

Baseline monitoring

Parliament has enacted the Infrastructure Act 2015, and Section 50 (although not yet in force) requires the Secretary of State to be satisfied that there has been

Operator will use to comply with these standard conditions. It is a requirement of the permit that the Operator operates in accordance with these techniques. We have assessed the techniques proposed and are satisfied that with these measures there will not be any significant pollution or harm to human health.

Condition 4.3.5 of the permit fulfils this requirement, where the change to the WMP is minor. However, in any other circumstance the Operator would have to make a variation application to the Environment Agency to be fully assessed in line with our current practices.

See comment above where condition 2.3.1 of the permit applies; the management plan will be incorporated into the permit, and becomes a requirement of the permit. This condition requires the activities to be carried out as described in documentation listed in S1.2 and can require an amendment to any management plan if necessary.

Activities are limited to those described in the WMP and in Table S1.1 of the permit. If the operator wishes to extend the activities by way of further hydraulic fracturing stimulation, a permit variation would be required.

The Infrastructure Act would require 12 months of monitoring for methane in groundwater for high volume fractures, The requirements of the Infrastructure

12 month baseline groundwater monitoring for methane before a well consent is issued. As this is an existing site, with a history of drilling, it is equally (if not more) important to establish sufficient baseline monitoring of pollutants in groundwater. The Waste Management Plan/Non technical summary does not specify the duration of baseline testing, what will be tested for, and the parameters of that testing.

'A scheme of groundwater quality monitoring has been agreed with the Environment Agency, which provides for the monitoring of groundwater quality prior to' during and after the KM8 hydraulic fracturing operation' (Waste Management Plan para 8.1.3)

Table 6.4 of the Baseline Water Quality Report proposes a very narrow suite of testing on a monthly basis. Testing at monthly intervals will not give the operator the chance to react quickly to pollution incidents, and pollution could in theory be occurring for a five week period before it is detected (see JBA Report at Appendix 1).

There should be a permit condition which requires a minimum 12 month baseline monitoring to reflect Parliaments intention (the Infrastructure Act 2015). It should also require the Applicant to baseline assess a range of other pollutants including heavy metals and NORMs (as were proposed by Cuadrilla in their applications) due to site specific considerations.

Baseline monitoring should be conducted more widely than 2km from the site given the importance of minimizing pollution of groundwater drinking supplies.

Act are not currently in force. The grant of an environmental permit does not mean the Operator can hydraulically fracture if they have not fulfilled the requirements of all other regulatory bodies.

Baseline monitoring for groundwater is described in Appendix 2 of the Emissions Monitoring Plan. Some baseline data has been collected from boreholes and surface water features offsite; the monitoring process is ongoing and will incorporate the on site boreholes recently given approval by the Planning Authority. The results of the baseline monitoring will be submitted for assessment prior to operations commencing.

Ongoing monitoring will have to be approved as part of a pre-operational condition to finalise the EMP.

See response above relating to the Infrastructure Act.

The expected fracture propagations have been modelled by the Applicant; for the uppermost fracture, the extent is modelled to be 180m from the well. Based on this information we consider that a radius of 2km is sufficient to

Include a permit condition requiring baseline radon testing in nominated residential premises before, during and after fracking on this site.

Include a permit condition requiring the operator to publishing all monitoring data on a public website within an agreed period of time.

Permit conditions should restrict commencement of permitted activities on site until all baseline testing has been properly documented and agreed, and completed to the satisfaction of the EA.

Seismic event procedure and well integrity

Include a permit condition which addresses procedures in the event of seismic activities on site and prescribes action that must be taken before activities may commence.

A condition requiring the testing of well casing integrity after every test frack to ensure pathways to groundwater are detected as early as possible.

Because well integrity compromise is identified as one of the main ongoing risks for groundwater pollution, on-going and post operational testing and monitoring of well integrity is required.

The cost of remediating this site will be substantial. It is not known when this will occur, whether the applicant will still be the operator, and the financial resources of the operator at the time of closure and

determine protection of groundwater.

The Environment Agency does not regulate radon emissions.

The Operator has stated that they will make the monitoring information available. We are unable to require the publication of data that we do not own and has not been submitted as a requirement of the permit.

The final baseline report will be submitted to the Environment Agency to fulfil a pre-operational condition.

Seismic events and the prescribed actions that must be taken will be detailed in the Hydraulic Fracture Plan. The permit requires our approval of this before fracturing can commence.

The well integrity will be pressure tested again, after perforating the well casing. And monitoring will continue throughout the fracturing process. A report on the well integrity will be submitted as a pre-operational requirement.

Refer to section 7.10.1 Article 14; no financial provision is required for this non hazardous waste facility unless deposited into a Category A waste facility. The legislation does not enable

remediation is also unknown. There should be environmental permit conditions dealing with obligations surrounding well closure and post closure monitoring and maintenance (para 11 non technical summary). The applicant should not be permitted to deal with this after the permit is issued, because it is integral to protecting the environment and human health, and groundwater in particular. This is also linked to financial provision comments.

Emissions Monitoring Plan - Ambient Air Quality Monitoring

Include a permit condition that adequately addresses the monitoring of dust deposition (see comments in paragraph 4.36 and 4.37).

Site drainage and risk of pollution

Permit conditions to address the deficiencies in site drainage highlighted in section 5 of this submission (also refer to JBA Report at Appendix 1) or a refusal of permit if the nature of the site means risks of pollution from spills and on site activities cannot be adequately mitigated.

A permit condition requiring the site to contain 110% of the potential on site fluids (for example flow back water).

This site should be equipped with telemetry or alarms to warn against fluid levels in storage tanks and perimeter drains rising or falling past safe/agreed levels. This would assist the early detection of pollution incidents.

A permit condition preventing the

us to require financial provision. The Operator will not be able to surrender the permit without demonstrating that the agreed closure plan has been implemented and that there is no risk of residual pollution.

Dust monitoring will be included as described in the Emissions Monitoring Plan which has to be approved by us before activities can commence. Condition 3.2 of the permit controls emissions that are not subject to emission limits. We do not consider that the regulated activities will cause dust nuisance.

Refer to section 6.11, we are satisfied with the surface water management arrangements, containment measures and incident response.

We are satisfied that the Operator will have the appropriate measures in place to deal with volumes of on site fluids

The operator is not permitted to use any

introduction of chemicals not listed in the application, without the prior written approval of the EA.

A permit condition seeking to restrict the length of time untreated flow back fluid is stored on site, to reduce the risk of pollution. In the Studvik report, para 7 it is defined as 'as soon as is reasonably practicable', which could mean anything.

Permit conditions should specify the minimum requirements of bunding of various parts of the site.

Given the existing limitations in the conceptualisation of groundwater and in particular a lack of understanding on groundwater flow pathways proposals for off-site monitoring of groundwater quality should be thoroughly re-assessed.

The proposals to monitor groundwater beneath the site are to be on a monthly basis, subject to future agreement with the Environment Agency. A greater frequency of monitoring than that proposed should be considered based upon assessment of likely contaminant travel times to potential environmental receptors. The scope of the monitoring should also be extended to include NORMS (naturally occurring radioactive materials) and heavy metallic contaminants.

Storage of Explosives and Chemicals

Permit conditions dealing with the safe on site storage of explosives.

Chemical storage area should be separately bunded. This should be listed as a permit condition.

chemical not listed in the approved WMP either on the chemical inventory or as an additive.

This comment relates to the radioactive substances permit, refer to application EPR/KB3098DE/A001.

The containment measures for the site are described in the WMP, and are considered to be satisfactory.

The Emissions Monitoring Plan will be reviewed and requires approval by the Environment Agency as a pre-operational condition requirement, this will include off-site monitoring of groundwater quality.

The storage of explosives is outside of the remit of an environmental permit.

The remit of this mining waste management and groundwater activity permit does not extend to the storage of raw materials or preparation of raw materials for the hydraulic fracturing

Water Use and Sustainability

Because environmental legislation is concerned with sustainability, fresh water supplies should not be used for fracking the event of drought or a period of water restriction/shortage, or where demand from the site is having a negative impact upon water pressures in the locality.

Financial Provision

In line with EA guidance, adequate financial provision should be set aside. A permit condition may be appropriate requiring a bond to be paid by Third Energy to cover future contingencies in the event Third Energy ceases to trade or is unable to meet its future commitments. That financial provision/bond should be paid in full before on site activities commence.

Waste Management

The Waste Management plan (Table 5.4) identifies flow back water as suitable for composting once it has been analysed for radionuclides. What non-radiological analyses will be conducted, and what evaluation criteria used, to determine which route is appropriate?

Often, the public is unaware of the origin of composted material. The environmental permit should prescribe maximum pollution parameters above which waste from the site should not be composted to protect the public and agricultural land from any harmful pollutants.

The Applicant should not be entitled to carry out on site waste water treatment activities unless they hold all necessary permits for this type of activity. FFR

stimulation.

Yorkshire Water does not have any concerns over the provision of the water required for the proposals. The maximum amount of water required for the operation is 4,000m³, where flowback fluid will be reused this will reduce the requirement for fresh water.

Refer to section 7.10.1 Article 14; no financial provision is required for this non hazardous waste facility. As the waste is non-hazardous and is not deposited into a Category A waste facility we have no power to require financial provision.

This comment relates to the radioactive substances permit, refer to application EPR/KB3098DE/A001.

Once the waste has left the site it is the responsibility of the Operator under Duty of Care to correctly classify the waste. The receiver of the waste should have their own waste acceptance procedures in place to assess and determine that the waste is fit for its proposed end use.

There is no treatment of waste water, the flowback fluid is not a waste until it is considered no longer fit for purpose

<p>queries whether the applicant can treat flow back fluid for re-use under the present application, if granted.</p> <p>Impacts of site activities on residents A permit condition restricting hydraulic fracturing to 'daylight hours' (paragraph 4.3.2.1 non technical summary).</p> <p>Due to rural location, permit conditions prescribing immediate measures to take to deal with complaints on nuisance matters including noise, odour, dust and nuisance.</p>	<p>The procedures for hydraulic fracturing are stated in WMP; it is a requirement of the permit that these procedures, including limiting this activity to daylight hours, are complied with.</p> <p>The WMP includes details of the complaints procedure the Operator will follow to record and report any complaint.</p>
<p><u>Friends of the Earth</u></p>	
<p><u>Consultation process</u></p> <p>We have a number of process concerns regarding the consultation. First, we note that a number of key documents which underlie the consultation were revised by the applicant after the consultation began, following concerns outlined at some length by North Yorkshire County Council under cover of a letter of 9 June. (The Council expressed concerns about failure to set out the anticipated maximum volume of gas, total reserves, the expected life of the well or the volume figures for each "treatment" by way of frack or the pressure to be used).</p> <p>Revised versions of the documents were subsequently produced by the applicant (dated 29 June) which appear to be those currently on the Agency's consultation website (save for the Non-Technical Summary – see further below). It is unclear to us when the revised versions were published by the Agency or whether sufficient time has been allowed to consider the new information.</p>	<p>The revised version of the Environmental Statement and some of its appendices were received at the Environment Agency on 13/07/15 and made available for the remainder of our consultation period (to 07/08/15). These same documents have been available for review as part of the Planning application consultation for an extended period.</p> <p>The Non Technical summary (NTS) dated 15 May is the NTS submitted with the environmental permit application. There was also an NTS of the Environmental Statement which was updated and received with the ES on 13/07/15. The ES NTS was added to the consultation along with the other updated documents.</p>

Clearly in the event that the new information was published relatively late in the process, further time to respond may be necessary. Please confirm.

Second, we note that the Non-Technical Summary has not been updated on the Agency's consultation pages as this remains the version dated 15 May. We find this failure confusing since the NTS seems to repeat a number of statements which gave the Council cause for concern, thereby creating conflict with other (more up to date) documents which have been published by the Agency. We note that the NTS of 15 May seems to claim that the sub surface at the frack site is properly categorised as a non-hazardous waste facility whereas the NTS of 29 June makes no such claim that we can see. We are not clear which proposition is being consulted on (see further below) and believe that the effectiveness of the consultation is impaired by these apparent conflicts.

The Environment Agency must consider what further steps are necessary to ensure effective and robust consultation in this matter.

At the time of our consultation on this application, we are satisfied that the correct versions were available on the consultation website.

The consultation period was extended from the standard 4 weeks, to 8 weeks.

Application documents that have been further updated have been made available on the E-consultation website and our Public Register.

There has been a misunderstanding over the Non Technical Summary (May 15) of the environmental permit application, and the Non Technical Summary (29 June) of the Environmental Statement. There is no conflict of information as these are two separate documents.

Our consultation procedures have been carried out correctly and for an extended period of time, meeting the requirements under EPR 2010.

The precautionary principle and EU Water Framework Directive

Friends of the Earth notes that the precautionary principle should be applied. This is essential to protect groundwater supplies from contamination, in accordance with the EU Water Framework Directive. Unless it can be proven beyond reasonable doubt that there will be no groundwater contamination, the development should not go ahead. This applies to all applications for shale gas exploration.

The United Kingdom Interdepartmental Liaison Group on Risk Assessment (UK-ILGRA) state in their paper "The Precautionary Principle: Policy and Application" that the precautionary principle should be invoked when there is good reason to believe that harmful effects may occur and the level of scientific uncertainty about the consequences or likelihood of the risk is such that the best available scientific

The applicant has failed to provide detail on activities and assess impacts adequately and therefore a precautionary approach must be applied.

The EU Water Framework Directive and environmental law provide for the precautionary principle to be considered in planning.

A summary of the Water Framework Directive is as follows:

The case of groundwater is somewhat different. The presumption in relation to groundwater should broadly be that it should not be polluted at all. For this reason, setting chemical quality standards may not be the best approach, as it gives the impression of an allowed level of pollution to which Member States can fill up. A very few such standards have been established at European level for particular issues (nitrates, pesticides and biocides), and these must always be adhered to. But for general protection, we have taken another approach. It is essentially a precautionary one. It comprises a prohibition on direct discharges to groundwater, and (to cover indirect discharges) a requirement to monitor groundwater bodies so as to detect changes in chemical composition, and to reverse any anthropogenically induced upward pollution trend. Taken together, these should ensure the protection of groundwater from all contamination, according to the principle of minimum anthropogenic impact.

There is considerable evidence from the US of fracking and unconventional gas operations leading to contaminated water supplies - for example from well spills, leaking wastewater pits and faulty well casings. Results from interim studies carried out by the US Environmental Protection Agency on groundwater near the town of Pavilion in Wyoming, as part of a major study, have found that fracking

advice cannot assess the risk with sufficient confidence to inform decision making.

The Environment Agency considers it has followed all relevant EU and UK legislation regarding the protective measures to be implemented when deciding to grant this permit. In setting permit conditions for the KM8 site we have had proper regard to the potential impact the proposed activities may have on all three environmental media. We are satisfied we have sufficient information to make an informed decision.

The permitted activities include the management of waste from hydraulic fracturing, whilst DECC issues the permission that authorises the hydraulic fracturing process itself. However, we do regulate activities associated with hydraulic fracturing as outlined in the body of this document. We have addressed the risks of those activities and how we have dealt with them.

led to methane contamination of deep groundwater and surface spills of fracking wastewater was likely to have caused shallow groundwater contamination.

Studies in the US have linked fracking to increased air pollution and respiratory problems. Monitoring in Texas has found levels of benzene – a known carcinogen – more than five times permitted limits near shale gas wells. Recent research by the Colorado School of Public Health and the Massachusetts Institute of Technology has found a correlation between proximity to unconventional gas development and birth defects, including congenital heart defects in babies and low birth weight.

Australia's National Toxics Network has documented the negative health and environmental impacts of unconventional gas production.

There is also evidence of seismic risk. The seismic report commissioned for the Department of Energy and Climate Change concluded that fracking at Preese Hall in 2011 caused earthquakes in Poulton-le-Fylde near Blackpool, and suggest that the most likely reason was that the well at Preese Hall was drilled through a natural fault which ruptured during a hydraulic fracturing treatment. The report also states that the events are unlikely to be unique.

The protection of groundwater relies on well integrity; a properly constructed well forms a barrier to prevent the escape of fluids into the surrounding strata via the wellbore. Well integrity will be tested prior to any fracturing operation, and the results must be submitted to the Environment Agency as part of a pre operational condition.

We are obliged to work to current government guidelines and the legislation that is in place at the time the decision is to be made.

Permissions are granted based on guidance issued by the Government and bodies such as Public Health England.

Activities at Preese Hall took place when the regulation of hydraulic fracturing was in its infancy. At the time that fracturing took place in 2011, our regulatory position was that the exemption in Article 2(3) of the Mining Waste Directive (MWD) applied, and on that basis we did not require the operator to obtain a permit under that Directive. We did, however, assess the fluids left underground, concluding that there was no risk to groundwater. We consider that the objectives of the MWD were met and that the environment is adequately protected.

Further information will be submitted in the Hydraulic Fracture Plan which will describe the fracturing process, and will have to be approved prior to fracturing operations commencing.

Scope of application – production

Third Energy's inclusion of the production stage within the scope of this application is unclear. We are concerned that insufficient information (e.g. duration, volumes etc.) is given for the production phase to enable the Agency to consider and quantify the risks resulting from production. In process terms, it is unclear what precisely the applicant seeks a permit to do in this case. Flowing the gas to the Knapton generating station is not the "production" activity since the NTS makes clear that production would take place after this "production test" has been completed. Yet the applicant also appears to believe the production phase could last up to 9 years.

Clearly the applicant seems to believe that production is possible at the site following fracking and that "only minor additional equipment will be required" to achieve this. We believe absolute clarity is required as to what additional steps the applicant proposes to take to put the well into production. We note the relative lack of information in this regard in the consultation and are simply unclear as to whether further drilling, new wells, or more fracking at the existing well comprises part of the production activity which the applicant envisages undertaking under the permit. (Such activities are standard in connection with production at shale gas wells). Lack of clarity on such an important issue tends to undermine the effectiveness of the consultation itself.

The proposal to go into production at a shale gas well is unprecedented in the UK and this fact does not seem to be addressed in the consultation either. The grant of a permit in this case would set a

The scope of the proposal is set out in section 3 of this document. The proposal includes a production test and may thereafter include full production from the well.

The permitted activities are constrained to the operations specified in the waste management plan. It does not cover the drilling of any well or more than the 5 main fracturing stages.

Should the applicant decide he wishes to drill further wells or perform additional fracturing stages, a permit variation will be required.

The proposed activities which are specified in the waste management plan, are those the applicant will be restricted to. They do not involve more than the 5 main fracturing events. If the operator progresses from a production test to actual production then the well will be permanently hooked up to existing production equipment on site.

In terms of the Environmental Permitting Regulations, the regulatory distinction between different stages of shale gas activity arises in relation to the management of extractive waste. The

significant precedent which requires very careful consideration. There is mounting evidence of the impacts of shale gas activity (including production) from abroad (eg: the United States) and the impacts, though increasingly concerning, are simply insufficiently well understood at this time to justify permitting such an activity at this point in time. It seems clear that production intensifies impacts including in relation to transport, waste, noise, water impacts etc. The grant of such a permit in the circumstances would we believe be premature and subjected to the closest scrutiny eg: to ensure that the Agency had adopted a precautionary approach.

If, on the other hand, the applicant merely intends to flow however much gas it is has been able to release from the rock through the five fracks due to be undertaken on the vertical (KM8) well alone, Friends of the Earth queries whether the proposal is properly described as an application to go into “production” at all. Similar applications in Lancashire to flow gas to the grid for up to 2 years were described as “Extended Flow Test” by the applicant (and the Department of Energy & Climate Change) and we are not clear whether the Agency has consulted DECC on this point to ensure the application is properly categorised.

distinction is between prospecting and extraction, rather than production.

Paragraph 9(2) of schedule 20 makes it clear that where the activity is properly regarded as prospecting in relation to deposits mentioned in the second paragraph of Article 2(3) of the MWD, the Environment Agency would be required to waive the requirements of that Directive if it was satisfied that the requirements of Article 4 were met.

When determining the earlier applications referred to, we took the view that the extended well testing would go beyond prospecting. However, they were exploratory as defined in the permit and associated decision documents.

Site details

Third Energy’s identification of proximate buildings and developments is inconsistent with the planning application in that it does not identify the caravan park located 420m North East of the site location and therefore, presumably, has not scoped the environmental impacts of

This point has been addressed and updated in the revision of the ES submitted in July 2015.

<p>the operations on users of the caravan site.</p> <p>The application also fails to mention the proximity of the Howardian Hills Area of Outstanding Natural Beauty (AONB) which lies 9km (at its nearest point at Amotherby) south west of the site.</p> <p>Third Energy has correctly identified the site location as being within Flood Zone I but has not stated that their Traffic Management Plan relies on using roads which are partially within a Flood Zone III area. We are concerned about the potential implications for access to the site in the event of such a flooding event.</p> <p>We are also mindful of the proximity to groundwater protection zones with the GWP Zone 1 lying approximately 5km to the North in the Pickering area.</p>	<p>This AONB is outside the relevant screening distances for consideration which is a maximum of 1km in relation to determination of a mining waste permit application or 50m for a groundwater activity.</p> <p>This is a matter for the planning authority, rather than the Environment Agency. Any concerns regarding traffic movements and the impact on surrounding infrastructure outside of the permitted boundary resulting from the operation of the KM8 wellsite ought to be addressed to the planning authority</p> <p>The groundwater protection zones have been considered in our assessment of the hydrogeological conditions of the site and surrounding area. We are satisfied that there will be no impact on these zones from the permitted activities.</p>
<p><u>Cumulative impacts</u></p> <p>The application details the adjacent proximity of the KM8 wellsite to the existing KM1 site. We are concerned that there is a significant risk of spillage from the KM8 site migrating to the KM1 site [and vice versa] and the applicant relying on environmental protection measures which are over 30 years old. We would expect the Environment Agency to assure themselves that these measures are both commensurate with existing requirements and that the measures are of excellent quality.</p> <p>The proximity of the existing KM7 and KM3 wells and the effects of potential seismic activity and the range of</p>	<p>We have reviewed the application in the context of the potential for cumulative impacts from the KM8 and KM1 sites and are satisfied that the separate surface water drainage systems and emergency spill procedures will contain any spillages onsite; reducing any risk of pollution occurring. We consider, therefore, the measures which have been proposed are appropriate given the nature of the intended activities.</p> <p>The existing KM7 (previously KM1) well is abandoned and KM3 is an injection well for the injection of produced waters</p>

<p>fracturing need to be considered as part of this application. More broadly we are not clear that the potential cumulative impacts from the applicant's oil and gas activities at a number of sites in the local area have been properly taken account of. The NTS appears to conclude that it is not necessary to consider the applicant's other schemes which are not "directly connected". We are far from clear that this approach reflects the test set out in case law. The Agency need to be satisfied that there is no risk to the well integrity of these existing wells and the pipeline from Kirby Misperton to Knapton alongside the risks to KM8.</p>	<p>from other wellsites managed by the Operator. There is no subsurface connectivity between any of the wells within the KMA wellsite. Consideration has been given to the proximity and whether there are any linkages between them. The Operator submitted a plan identifying the subsurface extent of all 3 wells, we are satisfied that there is no risk to the well integrity of the existing wells.</p> <p>The Hydraulic Fracture Plan will detail the measures that will be taken to monitor for and minimise the potential for seismic events.</p>
<p><u>The fracking process</u></p> <p>The ground-breaking nature of the proposed exploration and production requires the Environment Agency to exercise a strong precautionary approach to this application. We would caution the Agency against using conventional drilling as a benchmark for assessing the application. The onus on the Agency to adopt a precautionary approach is strengthened in this case because of the lack of evidence and thorough investigation of the impacts of fracking.</p> <p>Regulators in a number of jurisdictions have pointed to inadequate evidence and analysis in this respect. Just one well has been subject to exploratory slickwater fracking in the UK (Preese Hall in Lancashire), with what might be described as mixed consequences and</p>	<p>The Environment Agency considers it has followed all relevant EU and UK legislation regarding the management of extractive waste and protection of groundwater when granting this permit. The pollution prevention measures are set out in the WMP and supporting documentation incorporated into the permit.</p> <p>The activities of waste management and groundwater protection have been under regulation for many years and are well understood. In setting permit conditions for the KM8 site we have had proper regard to the potential impact the proposed activities may have on all three environmental media. We are satisfied we have sufficient information to make an informed decision.</p> <p>At the time that fracturing took place in 2011, our regulatory position was that the exemption in Article 2(3) of the Mining Waste Directive (MWD) applied, and on that basis we did not require the operator to obtain a permit under that Directive. We did, however, assess the fluids left</p>

was not, in any event, subject to regulation by the Agency. We are not aware that the technology to be used in the UK will be dramatically different to that in the USA and elsewhere which has contributed to so many environmental and health problems.

underground, concluding that there was no risk to groundwater. We consider that the objectives of the MWD were met and that the environment is adequately protected.

Permissions are granted based on guidance issued by the Government and bodies such as Public Health England, and we are satisfied that the operating techniques required by the permit will minimise the risks to the environment and to human health.

We note the proposal to use explosives to perforate the well prior to fracking but are unclear as to the impacts these may have on the surrounding environment eg: groundwater. Whilst some description of the substances proposed to be used is set out in the Waste Management Plan, we cannot see that environmental impacts are assessed there and believe clarification is required.

Perforation of the well casing is a necessary part of well completion. The impacts from such an activities are minimal and we are satisfied the necessary precautionary steps have been taken in relation to this activity.

As this is the first occasion that the Agency has been required to consider an application for production of shale gas from HVHF, it is essential that due regard is paid to the considerable uncertainties surrounding the potential environmental and health risks.

We have taken into consideration potential environmental and health risks this activity poses in permitting this site. The current proposal is limited to 5 fracturing events, only 1 of which would be classed as HVHF.

Existing well

We note that the KM8 well is already in existence and we take it that the well was not subject to regulation by the Agency at the time it was designed or constructed. This being so, it is not wholly clear to Friends of the Earth as to the basis on which the Agency seeks to satisfy itself that the well nonetheless provides adequate protection against environmental and health and safety

HSE regulates wellbore completion in accordance with Design and Construction Regulations 1995 and the Borehole Site Operations Regulations 1996. We have a Memorandum of Understanding with HSE and work collaboratively on new applications to ensure that standards of construction also meet the needs of environmental regulations. The Operator

<p>impacts. Whilst HSE regulation is likely to have applied at the relevant time, we are conscious this tends to focus on occupational health and safety as well as impacts on the wider community rather than environmental impacts, hence it does not seem to us to be sufficient for the Agency to rely on the HSE's evaluation in this regard. We look forward to clarification as to the basis on which the Agency believes it can get itself comfortable on this point.</p>	<p>has demonstrated that the original well was constructed in accordance with the requirements set out in these regulations.</p> <p>Well integrity will be tested following the pre-stimulation stage, the results will be provided to the HSE and to the Environment Agency as part of a pre-operational requirement.</p>
<p><u>Risk assessment</u></p> <p>The environmental risk assessment identifies significant major effects across a number of parameters and asserts that best practice well construction will reduce these risks to very low after mitigation. An analysis of the empirical data of well integrity carried out by Friends of the Earth calls into question these assertions and shows that the risks of well leakage as a result of hydraulic fracturing is significantly higher than conventional drilling. We are also concerned that, in some instances where the pollution pathway is along natural faults and induced fractures, that monitoring constitutes part of the mitigation measures – we question whether there are sufficient safeguards in place to ensure that monitoring prevents pollution and does not merely record a pollution incident.</p>	<p>HSE regulates wellbore completion in accordance with Design and Construction Regulations 1995 and the Borehole Site Operations Regulations 1996. We have a Memorandum of Understanding and work collaboratively to ensure that standards of construction also meet the needs of environmental regulations. We consider that wellbores constructed in accordance with the requirements set out in these regulations offer a high protection against well failure.</p> <p>Monitoring itself will not prevent pollution, however, we are satisfied that the construction methods will be consistent with the standards referred to in the 1995 and 1996 Regulations and so the risk of pollution will be kept to a minimum. The well was tested when first drilled, and well integrity will be re-tested following the pre-stimulation stage, the results will be provided to the HSE and to the Environment Agency as part of a pre-operational requirement</p>
<p><u>Waste management</u></p> <p>The application relies on the ability of the pipeline to the Knapton Generating Station and the station itself to transfer</p>	<p>Third Energy already transport gas to Knapton Generating station in this way from different wells in the surrounding</p>

and combust waste gas. This blurs the distinction between exploration and production of shale gas and therefore risks setting a dangerous precedent for regulation in a UK context.

Furthermore, the Agency needs to be entirely confident, should the use of the pipeline for the transportation and combustion of the produced gas at Knapton be impractical for Third Energy due to gas composition, that the measures used to suspend the well prevent any escape of the gas to air or water.

We are concerned that the applicant has failed to properly characterise the waste with sufficient detail. We are also concerned, in respect of the hydraulic fracture fluid that the quantities are inconsistent between the percentage and volume balances of the retained and flowback elements. We are concerned about the levels of reinjection of flowback water into the subsurface and the ongoing characterisation of this fluid.

We note the percentage balance put forward by the applicant as regards the flowback fluid and that retained in the subsurface. There is a sharp contrast between the estimates for the UK's only case of hydraulic fracturing in the Bowland interval (Preese Hall which experienced between 10-40% retention levels) and the applicant's estimates of 50-70% retention. This will have implications for the amount of waste that would be stored on site awaiting characterisation prior to transfer to the nominated waste treatment facility and underlines the uncertainty and lack of evidence on which the Agency is

area so the Environment Agency is confident in saying that there is no technical reason why this cannot be achieved in the context of KM8. As explained above, in terms of the Environmental Permitting Regulations, the distinction is between prospecting and extraction.

This application is for well testing and production if commercially viable as described in the WMP. The gas is not a waste at any stage of the process as it can be used to generate electricity. We are confident that the equipment at Knapton can deal with the expected gas composition.

The Environment Agency can confirm it is satisfied that the application properly characterises all wastes and demonstrates a need for ongoing clarity in relation to flowback fluid.

Reinjection of flowback fluid for disposal will not be permitted. Where flowback fluid can be treated and reused as hydraulic fracturing fluid it will be reinjected as part of the fracturing process.

The Applicant anticipates a flow back of about 30%, up to a maximum of 50%. The volume of retained fluid depends on the geological and physical characteristics of the target formation. Cuadrilla estimated that 10%-40% of fluid would return to the surface, (60%-90% being retained). Third Energy's estimate is not inconsistent in this regard.

required to base any decision on the application.

We are also concerned about the implications for the operation in the likely event that large levels of NORMs are extracted from the shale and the assessment and monitoring of these levels.

No consideration seems to have been given to the impact of the release of nitrogen to the atmosphere given the capacity for the nitrogen released to convert into NO_x (in sunlight) – you will be aware of the harmful impact of NO_x on air quality; and the recent decision by the European Union to infract the UK over non-compliance with the Air Quality Directive.

We would also expect the Agency to assure themselves of the capacity of the permitted waste treatment facility to handle the quantities of waste that could potentially be produced by the applicant. We understand that DEFRA has made clear that just 3 facilities in England are currently capable of processing and making safe this waste stream.

The applicant has detailed the experience required of the wellsite supervisor. We note that this does not stipulate experience of hydraulic fracturing and instead relies on more generic experience from conventional oil and gas production. Given the uncertainties surrounding this technique, we would expect professionals to have more direct experience – see for example Article 11(1) of the Mining Waste Directive.

This comment relates to the radioactive substances permit, refer to application EPR/KB3098DE/A001.

The Applicant has confirmed their position on nitrogen lifting, there will be no nitrogen vented to atmosphere. We are satisfied that the process in place for managing nitrogen is suitable and can be managed without causing environmental harm.

As part of the RSR permit application the Applicant has demonstrated that there are suitable existing permitted waste facilities that can accept and treat the radioactive waste. Refer to application EPR/KB3098DE/A001.

We are satisfied that the applicant has demonstrated appropriate technical competence. The experience and training for each member of staff is set out in the management system which is a requirement of condition 1.1 of the permit, and as described in section 5.3.4 of the WMP.

Operator competence in this context will continue to be considered throughout the life of the permit.

<p><u>Surface water</u></p> <p>As regards surface water handling, we are concerned about the risks of surface water, groundwater and soil contamination in the event of extreme weather conditions. We are concerned that heavy rainfall and the capacity of on-site storage are not adequate to deal with the volumes expected, which could also cause groundwater pollution.</p>	<p>These concerns have not been particularised. For its part the Environment Agency can confirm it is satisfied that all appropriate measures will be in place to acceptably reduce any risk of contamination in the event of extreme weather conditions. The flood risk assessment included within the Site Condition Report describes the level of risk of flooding offsite and concludes that there is no substantial risk during the operation.</p> <p>Water will be contained on the KM8 well pad and collected in tankers for removal, the water levels will be monitored to ensure no overflow.</p>
<p><u>Subsurface release</u></p> <p>There is growing evidence of activities relating to hydraulic fracturing resulting in releases to the natural environment. The risk of well failure combined with the actual consequences of fracking (namely the creation of large numbers of pathways through the rock of indeterminate scale) combined with natural faults (which provide pathways for pollutants) need to be addressed by the Agency in considering this permit application. Fracking mobilises pollutants which previously were immobilised in the rock – including hazardous substances such as methane and, potentially BTEX – thereby arguably creating greater risks to the environment and human health as a result.</p> <p>As indicated earlier, we are also concerned that the effect of seismicity on the existing gas infrastructure in the area can create additional pathways for pollution into the rock and groundwater strata.</p>	<p>The Environment Agency has assessed the risks associated with pollution occurring from activities on the site and is satisfied that the risk of any significant pollution is minimal.</p> <p>See previous response regarding seismicity.</p>

Groundwater

We are very concerned that groundwater will be inadequately protected in this case and that there is a real risk of breach of the Groundwater Directive (2006/118).

First, we are concerned about the prospect of well failure and longevity which has the potential to cause significant risk of pollution of groundwater. Leaking wells are known to be a problem for the shale gas industry. The recent UNEP briefing supports this stating:

“Leakage of fracturing fluids into the water table causing water contamination or explosions can occur if the cement columns around the well casings have an imperfect seal. Several examples of leaks in the casing leading to explosions or contamination of the water table have occurred in the USA”

A steadily accumulating body of evidence from the USA demonstrates that groundwater has been contaminated through fracking activities and the European Commission report makes clear this is an acknowledged risk. The British Geological Society accepts that the USA experience has to be taken into account for the UK. No information seems to have been provided by the applicant concerning the risk of failure or longevity of the well.

Secondly, we are concerned that the groundwater monitoring measurements

The Environment Agency has fully assessed the risks associated with pollution occurring from activities on the site and is satisfied that the risk of any significant pollution is minimal.

See section 7.6 of this document for our consideration of groundwater protection.

Refer to section 5.1.2 for well integrity.

HSE regulates wellbore completion in accordance with Design and Construction Regulations 1995 and the Borehole Site Operations Regulations 1996. We have a Memorandum of Understanding and work collaboratively with HSE to ensure that standards of construction also meet the needs of environmental regulations. We consider that the well was constructed in accordance with the requirements and offers a high protection against well failure and are therefore satisfied with the measures proposed by the operator.

A pre-operational condition requires the operator to demonstrate that well integrity has been re-assessed prior to fracturing taking place.

The quality of groundwater varies so assessment against DWS or a trigger

are reported in the Environmental Statement in the absence of reference levels (e.g. UK Drinking Water Standards) thus making it difficult for the general public to make an appropriate assessment of these levels and, indeed, what levels act as a trigger for mitigation action to take place.

In this particular case, we note that the borehole will pass through a number of strata which contain groundwater which appear to constitute "groundwater" within the meaning of Article 2(2) of the Water Framework Directive (2000/60) – namely the Corallian Group, Osgodby Formation, Ravenscar Group and Dogger Formation. Indeed the applicant concedes that the Osgodby Formation is classified by the Agency as a secondary source, meaning that it would appear to require enhanced protection through Articles 6 – 8 of the WFD. It is unclear as to the basis on which drilling through these strata and using the well to frack is considered consistent with Article 4 of the Directive for example.

The hydrogeological assessment contains little or no analysis of the water found in the Triassic, Permian or Carboniferous strata or the risks to these sources. We urge against a narrow reading of the scope and obligations in the Directive. We are concerned about the lack of analysis in this respect, given it is the carboniferous rock which will presumably be fracked.

We are also mindful of the fact that there is no reporting of the levels prior to the development of KM1. Given the sites are next to each other and KM1 is an established well, we are concerned that it

level is not necessarily meaningful; whereas comparison with the baseline gives a better indication of any deterioration.

The well was constructed in accordance with Design and Construction Regulations 1995 and the Borehole Site Operations Regulations 1996. We work collaboratively on new applications with HSE to ensure that standards of construction also meet the needs of environmental regulation. We consider that well was constructed in accordance with the requirements and offers a high protection against well failure and therefore is considered consistent with Article 4 of the MWD. Also refer to section 7.6 of this document relating to groundwater protection.

Refer to section 7.6 of this document where other groundwater bearing strata are discussed.

There is no evidence of any current impact resulting from activities associated with the KM1 well site. The activities relating to the KM8 site will be monitored from the outset so it is

will be difficult to establish robust baseline levels of water quality in this case. This creates real problems both in terms of the effectiveness of the EIA (on which the groundwater permit relies); the extent to which Third Energy's hydrocarbon activities have already caused pollution; and the extent to which further risky activities can possibly be permitted at the site (see cumulative impacts). More generally we are concerned that groundwater monitoring will take place after the permit is granted. This seems to us to back to front. It is unclear how the duty to limit the input of pollutants into water may be discharged when baseline levels of pollution are not established before the requisite measures are put in place to meet the duty.

Third, we note that the applicant has seemingly somewhat arbitrarily set a 2km limit for scoping of water features but are unclear as to the justification for this distance criterion. Furthermore, we are extremely concerned about the level of abstraction activity within this 2km range including:

- i. The proximity of the Sugar Hill Drain and its drainage into the wider surface water network.
- ii. The abstraction licence exercised by Flamingoland – we are concerned about the effect of any pollution from KM8 on IUCN Red List Critically Endangered Species (e.g. Sumatran Tiger).
- iii. The extent of private water supplies and boreholes and potential contamination of food production from any pollution event.

incorrect to say that baseline levels will not be established for the site.

The baseline data will be provided to the Environment Agency as a requirement of a pre-operational condition.

The Environment Agency has assessed the risks associated with pollution occurring from activities on the site and is satisfied that the risk of any serious pollution is minimal.

The expected fracture propagations have been modelled by the Applicant; for the uppermost fracture, the extent is modelled to be 180m from the well. Based on this information we consider that a radius of 2km is sufficient to determine protection of groundwater.

There is one abstraction point within 2km of the site for Flamingo Land from Costa Beck. We are satisfied that there is no pathway for contamination of this water course, with the abstraction point upstream of where the Sugar Hill Drain would link to the wider surface water network. In addition there is no discharge to surface water permitted.

<p>Fourthly, we would expect the baseline monitoring carried out by Third Energy to fully comply with legislation current at the time of permitting. These should include, but not be limited to, the additional provisions included in the Infrastructure Act 2015. For example, the 12 month monitoring period for methane in groundwater should be enforced. Although it is unclear as to the basis on which monitoring only for methane is sufficient to ensure compliance with obligations such as Article 4 of the Water Framework Directive, given the large variety of pollutants fracking mobilises from rock.</p>	<p>Baseline monitoring will be required in a manner that will satisfy UK and EU obligations. The Infrastructure Act would require 12 months of monitoring of methane in groundwater for high volume hydraulic fracturing events; only 1 of the proposed 5 fracturing stages meets this criteria. The requirements of the Infrastructure Act are not in force, and the provisions of the Act are not enforced by the Environment Agency. The grant of an environmental permit does not mean the Operator can hydraulically fracture if they have not fulfilled the requirements of all other regulatory bodies.</p>
<p><u>Chemicals</u></p> <p>We note that the Waste Management Plan seeks permission to use certain hazardous chemicals in connection with fracking (for example acetic acid, “safe cide”, “safe core EN”, Safe Scav NA and HCl at 30 – 60% concentration). Yet it also claims that substances used to frack will be non-hazardous. We note that the NTS of 15 May claims that the sub-surface may be characterised as a non-hazardous waste facility, although this claim does not appear to be repeated in the NTS of 29 June (not consulted on). The documents do not make clear what is being consulted on – the proposal not to use hazardous substances (NTS 15 May) or the proposal to use a variety of hazardous materials (waste management plan)?</p> <p>Clearly, an application to use such chemicals in relation to the sub surface in this case means that that area must be categorised as a hazardous waste facility in accordance with the Mining Waste Directive (2006/21). It is far from clear to us that this is the basis on which the applicant has assessed the sub-surface</p>	<p>The environmental permit will categorically not authorise the use of chemicals hazardous to groundwater.</p> <p>Appendix 5 of the WMP lists the chemicals that have been assessed as non-hazardous in respect of impact on groundwater (refer section 3.2 of this document).</p> <p>Only the chemicals listed in Appendix 5 may be used in the hydraulic fracturing fluid.</p> <p>See previous comment over misunderstanding over which NTS is being referred to.</p> <p>The underground accumulation of retained fracture fluid will be designated a non-hazardous mining waste facility as described in the WMP and in section 5.1.4 of this document.</p> <p>We are satisfied that the base chemicals that are proposed for use in the hydraulic</p>

<p>in relation to its application and we believe that further work is needed (and consultation as necessary) to address these gaps (eg: as regards the Category A analysis or need for a financial guarantee).</p> <p>The proposal to use such chemicals also sits somewhat oddly with the claim (set out in the NTR of 15 May) that “The components of the hydraulic fracture fluid are commonly used substances and can be found within most households, such as food and toiletries.” It is not clear to us at least that most food contains biocides or other substances classified as hazardous by the Agency, but no doubt the Agency can clarify.</p>	<p>fracturing fluid are correctly classified as non-hazardous to groundwater. The Operator is not permitted to use any chemical that is not on this list within the WMP.</p>
<p><u>Closure and monitoring</u></p> <p>We are not aware that the applicant has submitted a closure plan contrary to Article 5(3)(f) of the Mining Waste Directive. Further consultation on the plan would of course be necessary should it be received at a later date. So far as monitoring is required, we are obviously concerned at any proposal for self regulation given the importance of independent oversight by the Agency to avoid occurrences such as those which appear to have arisen at Barton Moss.</p>	<p>A closure plan will be submitted as detailed in section 3.5 of this document, we consider this to be a suitable arrangement.</p> <p>The Operator will not be self regulating, however, self-monitoring is a standard procedure across a variety of industrial sectors, under environmental permitting The Environment Agency has assessed the Applicant as being competent to carry out the activities applied for, and monitoring will have to be carried out to a specific standard, analysed by an independent accredited laboratory.</p> <p>Barton Moss cannot be compared to this site; this permit includes a groundwater activity, and surface and groundwater monitoring is a requirement of the permit.</p>

<p><u>Financial guarantee</u></p> <p>We remain deeply concerned as to the basis on which the Agency requires financial provision for the carrying out of waste activities under any permit granted. Whilst we regret the Agency's continuing refusal to be open and transparent about the sums which operators intend to set aside, it seems to us to be at best minimalist to confine the requirement to a very limited specification around clean up of what is categorised as hazardous waste.</p>	<p>Refer to section 7.10.1 Article 14; no financial provision is required for this non-hazardous waste facility which is not a Category A facility. We do not have power to require financial provision.</p>
<p><u>Noise</u></p> <p>As indicated earlier, the omission of the caravan site 420m away from the wellsite indicates that the applicant has failed to assess the impact of noise on all receptors. The applicant's assertion that the duration of 8 weeks for the highest noise levels is "short" is highly subjective and could equally be regarded as causing significant nuisance and loss of amenity.</p> <p>It is also clear from the application that the applicant has failed to assess noise impacts from large site traffic (e.g. HGVs) especially as they move through the village of Kirby Misperton. We would urge the Environment Agency to consider the noise impacts of the entire operation including transport when considering the strength of the application.</p>	<p>We are satisfied that the Operator will have techniques in place to minimise noise from the permitted activities. The caravan site has been considered in the updated Environmental Statement.</p> <p>This is a matter for the planning authority, rather than the Environment Agency. Any concerns regarding noise from traffic movements resulting from the operation of the KM8 wellsite ought to be addressed to the planning authority in accordance with Schedule 9 paragraph 4(1)(b) of the Environmental Permitting Regulations.</p>

<p><u>Traffic</u></p> <p>We are concerned about the impact of traffic moving through the village of Kirby Misperton and the increased noise and effects on air quality on residents in the village.</p>	<p>This is a matter for the planning authority, rather than the Environment Agency. Any concerns regarding increased traffic movements resulting from the operation of the KM8 wellsite ought to be addressed to the planning authority in accordance with Schedule 9 paragraph 4(1)(b) of the Environmental Permitting Regulations.</p>
<p><u>Climate change</u></p> <p>Climate change</p> <p>The recent (2014) Inter-Governmental Panel on Climate Change Summary for Policy Makers concludes that extreme weather is being caused now by climate change, and will in the future - more frequent hot and fewer cold temperature extremes, heat waves will occur with a higher frequency for longer, more intense and frequent extreme rainfall, resulting in flooding.</p> <p>Furthermore, if we are to stay within safe global carbon emissions, 80% of declared proven fossil fuels are unburnable.</p> <p>Shale gas exploration is incompatible with national and local commitments to mitigate climate change in the Climate Change Act 2008. The climate change impacts of an over-reliance on gas are very serious, with the Committee on Climate Change concluding that to meet our carbon budgets, electricity generation must be almost entirely decarbonised by 2030. The CCC have warned that “excessive use of unabated gas-fired capacity... would be incompatible with meeting legislated carbon budgets” and the Climate Change Act.</p> <p>Peer-reviewed evidence suggests shale gas is more polluting than conventional</p>	<p>We presume that this representation is directed at the Environment Agency rather than local government.</p> <p>We consider that shale gas is a form of conventional gas which may be obtained by unconventional means (i.e. hydraulic fracturing). It is not accepted that shale gas is more polluting than conventional gas or coal, as is suggested.</p> <p>The production of shale gas is to form part of the UK’s energy mix and will be regulated by the Environment Agency via the use of robust permit conditions.</p>

gas, and could be more polluting than coal. Researchers in the US have concluded that “Compared to coal, the footprint of shale gas is at least 20% greater perhaps twice as great on the 20 year horizon and is comparable to coal over 100 years”. The Tyndall Centre at Manchester University conducted an assessment of the climate and environmental risks from shale gas and concluded that shale gas extraction poses “significant risks to human health and the environment” and that there is no evidence to back-up industry claims that shale gas could be a transition route to a low carbon future. The head of the United Nations Environment Programme has referred to shale gas as a climate “liability” that is likely to delay the transition towards renewable energy.

Local government must take its climate change obligations seriously and refuse damaging development.

DRAFT

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

A total of 248 responses were received, including an online petition which generated 528 emails raising points that are summarised and considered below.

Although the consultation ended on 07/08/2015, any comments that have been received after the close of the consultation and prior to issue of this minded to position were taken into consideration as part of our determination process.

We can only consider comments which are relevant to the management of the extractive waste arising from gas extraction; including hydraulic fracturing, and groundwater protection as part of a groundwater activity.

For consultation comments that relate to matters beyond our regulatory control see section 3 below.

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

Type of applications applied for, consultation and commercial production

Concerns were raised that the environmental permits applied for were not consulted on properly; in that they the applications had always been referred to as being for test fracks. This appeared to contradict what has been submitted for both the environmental permit applications and the planning application.

The environmental permit application has been consistent with regards to the activities being applied for; as stated in section 2.3 of the WMP and section 2.3 of the Non-technical summary.

This covers the five stages, from pre stimulation workover to closure. The 4th stage is production from the five fractures detailed in the WMP, and the permit covers this stage should the Operator decide the well is commercially viable. The Operator bases their decision on the data gathered during the production test stage; moving to production may mean they need to seek new permissions from other regulatory bodies. The Operator must ensure they have all the relevant permissions before they continue.

Environmental permits are not time limited; therefore the period of time referred to in the planning application is not taken into account for the purposes of environmental regulation.

The WMP covers all stages of the activity and will be amended as necessary; this will require a variation to the permit by way of an application to the Environment Agency unless any proposed change is classed as minor, in accordance with condition 4.3.5 of the permit.

The environmental permit is a bespoke permit that can include any number of activities subject to the Environmental Permitting (England and Wales) Regulations 2010 (as amended). With regards to the oil and gas sector, its scope is not necessarily limited to exploration activities.

All the documents submitted as part of the environmental permit application were made available for the period of the consultation. This includes the WMP which describes the proposed activities. Where these documents have since been updated in response to questions we raised during determination, the latest versions have also been made available on the public register, and via our e-consultation tool.

We are satisfied that the consultation on the permit application has been carried out correctly.

We carried out an extended consultation on the Application taking into account the Environmental Permitting Regulations and our statutory Public Participation Statement and the requirements of Article 8 of the Mining Waste Directive (MWD).

Each environmental permit application is assessed on its own merits and considers the site specific risks. The grant of one environmental permit that allows hydraulic fracturing and potentially shale gas production does not set a precedent, and does not mean all hydraulic fracturing applications will be granted.

Human health impacts

We are satisfied that the activities we are permitting will not give rise to significant pollution or cause harm to human health. This is supported by the comments in part 1, above, from Public Health England.

The main issues that could have an impact on human health are discussed in more detail below.

- **Stress**

A number of comments have raised concerns that the activities will cause stress and will affect the emotional wellbeing of the local community.

See above in relation to Public Health England comments. Public Health England have raised no objection and we are satisfied that the activities we are permitting will not give rise to any significant pollution or any emissions that will cause harm to human health.

- **Noise**

Concerns have been raised that the activities will cause noise pollution.

We are satisfied that the activities, if carried out in accordance with the permit, will not cause noise pollution; see section 6.13 of this document.

Condition 3.4 of the permit controls Noise and Vibration and requires that such emissions are minimised and, in the unlikely event that the activities give rise to pollution due to noise or vibration outside the site. A noise management plan has been submitted to the Environment Agency for approval prior to being implemented.

- **Odour**

Concerns have been raised that the activities will cause odour pollution.

We have carefully considered all the permitted activities and are satisfied that they are unlikely to give rise to any significant odour.

Condition 3.3 of the permit controls Odour and requires that emissions are minimised and, in the unlikely event the activities give rise to pollution due to odour outside the site, an odour management plan can be requested and will have to be submitted to the Environment Agency for approval and, once approved, will have to be implemented.

- **Air emissions**

Concerns have been raised about how fugitive methane emissions would be controlled, and how a permit could be granted where the air quality assessment shows there may be some exceedances in air quality for some pollutants during fracking.

Condition 3.2 of the permit applies controls on fugitive emissions. Flowback fluid containing methane will be transferred through the separator and to the storage tanks via enclosed pipework. As described in Appendix 8 of the WMP, pipework and connections will be tested for integrity prior to use and will be monitored during operations to minimise the release of fugitive emissions.

We have assessed the air quality impact assessment report submitted with the application; the report covers the whole operation on the site and is not limited to the activities regulated by this permit.

The air quality dispersion model predicts the process contributions of nitrogen dioxide at the receptors identified in the model, will exceed the Air Quality Standard during high intensity operational phases. These phases will be the five fractures that are proposed to last no more than 5 hours each. The model makes predictions of process contribution based on full operation over a 1 year period. Therefore the actual process contribution of nitrogen dioxide over a 25 hour period (5 x 5 hours) will be much less.

We are satisfied that there will be no significant impact on air quality from the regulated activities.

- **Drinking water protection**

Concerns were raised that the proposed activities will pose a risk to drinking water supplies. Yorkshire Water has advised that public water supplies for this area come from the Corallian aquifer with some surface water abstraction from the River Derwent.

We are therefore satisfied that the permitted activities will not cause pollution of drinking water supplies, this has been confirmed as the view of Yorkshire Water in their response to the consultation detailed above.

Additionally, the permit conditions require mitigation measures to protect groundwater

and ensure no pollution occurs.

Operator competence and lack of trust in the Operator

A number of concerns have been raised about the Operator and their ability to run the operations on site competently. Concerns were also raised that the Operator was not transparent in their dealings with the public.

The permit conditions require the Operator to have an appropriate management system in place that includes details of staff capability, roles and responsibilities, experience and training records to demonstrate technical competence. We are satisfied with the management system proposed by the Operator in the application, and if a permit is granted, we will assess the Operator's activities and we will be checking they comply with their permit conditions as part of our compliance work.

We have carefully considered operator competence and we have no reason to believe that they would not comply with permit requirements and conditions.

We have considered all relevant factors and have determined that there is no reason to consider that the Operator will not operate in accordance with the permit.

It is quite common for Operators to conduct their own public events. Although we offer guidance to Operators, we are not involved in directing how the Operators should conduct their public relations exercises.

Overuse of groundwater

Concerns have been raised that the permitted activity will use large quantities of local groundwater and that this is not a sustainable approach.

The Applicant states in the WMP that they will be using mains water from Yorkshire Water. Yorkshire Water have abstraction licences for their water supply and any water they provide will have to be within the limits they are licensed to abstract. If the Applicant wishes to abstract groundwater they will need to apply to the Environment Agency for an abstraction licence and this will be assessed to ensure that any abstraction would not have a detrimental impact on the water environment before a licence could be granted.

The maximum volume of water the Operator may require is 4,000m³, it could be less where some of the flowback fluid can be treated and reused.

We are satisfied that the Operator will take measures to minimise the amount of fresh mains water required, and will in any event not exceed 4,000m³ as stipulated in the WMP.

Hydraulic fracture fluid and nature of chemicals used

The WMP includes a list of chemicals that may be used in the hydraulic fracture fluid, these chemicals are assessed as non-hazardous to groundwater by the Environment Agency. Comments have been received about the inclusion of sulphuric acid in this list.

The list of chemicals in the WMP Appendix 5, are assessed as to whether they meet the test for being Persistent, Bioaccumulative or Toxic as defined in the REACH regulations and TGN.

Sulphuric acid does not meet the hazardous criteria in this regard as detailed in section 3.2 of this document, and therefore in the context of harmfulness to groundwater is classified as non-hazardous.

The Applicant has provided a full list of all the additives and fluids that will be used for hydraulic fracturing. We have assessed the additives to be used and we do not consider that they will cause environmental harm at the rates and levels of use proposed. The fluids are non-hazardous to groundwater and the permit will limit the composition of the fluids to those disclosed in the Waste Management Plan.

Reference has been made to the use of biocides in the treatment of the waste water; the Applicant proposes to apply UV treatment to all fluid going into the well to remove the need to use biocides. This is stated in the WMP and as such will be a requirement of the permit.

Underground waste facility and fate of fluid left underground

Concerns were raised on the accumulation of waste fracturing fluid underground which the Applicant had referred to as best available technique.

We have taken a conservative approach and this is why appropriate mitigation measures have been proposed and included throughout the permit. These will limit the potential of fracture propagation beyond the target formation and this will in turn reduce the chances of fracture fluid being lost to other formations. These mitigation measures include monitoring the propagation of the fractures using seismic arrays.

Preese Hall in Lancashire is quoted as evidence of the risks; the experience there led to the moratorium on hydraulic fracturing until a more controlled method could be established. As a result DECC created the traffic light system and the requirement for a Hydraulic Fracture Plan before lifting the fracturing ban.

The Hydraulic Fracture Plan to be approved by DECC will also need approval by the Environment Agency given our own regulatory duties, prior to hydraulic fracturing commencing and this will be a condition of the permit. The plan will be designed to ensure that the propagation of fractures is carefully monitored.

See section 7.6 on groundwater protection above for more details.

Well integrity

Concerns were raised that there was no certainty that the well is safe and structurally adequate to prevent leakages that could cause pollution.

The borehole was constructed in 2013 in accordance with the requirements of the HSE and the Petroleum Exploration and Development Licence. It is designed in accordance with industry best practice and in compliance with the Borehole Site Operations Regulations 1996 and Installation and Wells (Design and Construction) Regulations 1996 (DCR). The DCR requires the well design to be such that no unplanned escape of fluids can occur.

Well integrity testing will be carried out prior to any hydraulic fracturing taking place. See section 5.1.2 of this document.

When the well is no longer productive and the operator wishes to decommission it they will have to carry out any necessary works to make the well safe and prevent any leakage that could cause environmental damage. The Health and Safety Executive have detailed legal requirements relating to this stage of the well life, which the operator will have to comply with. The Environment Agency will be involved in this process to ensure that any groundwater is protected during the abandonment process and for the future. The operator will have to provide sufficient evidence to satisfy the Environment Agency that the decommissioned well will not cause any on-going or future impact on the environment before surrender of the permit would be accepted. Monitoring at the site will continue into the post decommissioning period and will have to demonstrate that no impact has occurred and that there are no on-going environmental issues.

Contamination of surface water and groundwater

Concerns were raised that surface water and groundwater may be contaminated by the proposed hydraulic fracturing activities.

Some respondents noted that the Applicant intends to recycle flowback fluid wherever possible. Concerns raised were that the recycling without treatment enhances the potential for toxic build-up below ground.

We have reviewed the Environmental Risk Assessment and the Hydrogeological Risk Assessment provided by the Applicant against our knowledge and conceptual understanding of the location. We are satisfied that the hydraulic fracturing activities (in terms of groundwater), which are controlled by this permit will not pose a risk to groundwater or surface water given the mitigation measures required. Public water supplies are not at risk, as confirmed by Yorkshire Water.

The Waste Management Plan (WMP) and the Environmental Risk Assessment specify the pollution prevention measures that will ensure that surface water and groundwater

will be protected. The WMP sets out the nature of the fluids to be used in each stage of the process, the expected volumes and the subsequent options for treatment or disposal, where applicable.

The injection borehole will discharge hydraulic fracturing fluid (which may include reused flowback fluids) only into one geological formation as described in section 7.6 of this document. The target layer is the Bowland Shale Formation. The permit also requires the Operator to monitor the location, orientation and extent of induced fractures and provide this information to the Environment Agency.

The fluid used for hydraulic fracturing will contain only additives that have been assessed as non-hazardous to groundwater (WMP Appendix 5), this limitation applies at all times and is enforced through a condition in the permit, including where the fracturing fluid contains re-used flowback fluid, which will have been separated from the gas and sand. The operator will be required to reuse flowback fluid from the fracturing process in subsequent fracturing phases, wherever possible, to reduce the generation of waste requiring disposal. Flowback fluid will undergo electrocoagulation treatment and will be analysed to ensure that it is suitable for reuse; the fluid that can be injected must remain non-hazardous. If flowback fluid is not suitable for reuse in the fracturing process it will be tankered off site and taken to a permitted site for treatment and subsequent disposal.

Flowback fluid is fluid which returns from hydraulic fracturing operations where fresh water has been injected into the formation to create fractures, together with formation water. It is not a naturally occurring fluid; however the minerals that are returned are naturally occurring within the target formation. If flowback fluid cannot be reused it may be because it returns so slowly that it is not viable to wait until a sufficient quantity is available to treat and reuse.

We are satisfied that measures can be taken to ensure that the fracturing fluids do not migrate from the target formation. We have included a pre-operational condition that will not allow any hydraulic fracturing to commence until we have approved, in writing, the Hydraulic Fracture Plan, which is referred to in section 4.3.2 of the WMP.

It is not anticipated that the fracturing fluids, which remain in the ground after the operations are complete, could migrate any distance from the fractures created by the hydraulic fracturing process within the target formation.

In order for fluids to move in the rock a driving head would be required to produce a gradient to cause fluid movement. Once the hydraulic fracturing stage is complete the pressure is released to allow the fluid and gas to return to the extraction well and the pressure gradient will be from the rock towards the well. It is expected that about 30% (maximum 50%) of the injected fracturing fluid will return to the surface as part of the flowback fluid. Fracturing fluid left behind will have nothing to 'push' it further into the formation. There would be limited potential for fluids to migrate further into the rocks. The shales are capable of absorbing some of the fracturing fluid, allowing it to migrate away from the fractures, however the distance over which that migration could occur is small due to the inherent low permeability of the shales.

When the well comes to the end of its useful life it will be either suspended or plugged and decommissioned; this process ensures that there is no pressure gradient remaining that could continue to push fluid away from the well locations.

We have assessed the proposed hydraulic fracturing activities and we have concluded that the Applicant requires a groundwater activity permit. An assessment of the impacts on groundwater has been reviewed as part of the decision on whether or not a groundwater activity permit should be issued. The decision document outlines how we have made our decision: see section 7.6 of this document.

Further details on the protection of surface water are covered in section 6.11 of this document, and discussed below in relation to Spillages.

The operator will be carrying out groundwater monitoring to confirm that there is no pollution of groundwater, as well as monitoring the propagation of the hydraulic fractures they induce to ensure that they remain within the target formation. We are satisfied that the Applicant has adequately defined the risks to groundwater in the documents submitted for this application; and that the appropriate mitigation measures to protect the groundwater have been imposed through the permit.

Concerns have also been raised that there is an insufficient natural barrier to upward migration of gas or contaminants to protect the groundwater and surface waters from being impacted by the proposed activity.

We are satisfied that we have fully assessed the risk to surface water and groundwater and that there will be no unacceptable impact or risk of pollution.

Spillages

Concerns were raised that the risk from potential spillages had not been adequately addressed by the Applicant in their risk assessment. Concerns were also raised about potential spillages off-site during transport of the waste water.

The site is lined with an impermeable membrane to protect the underlying soils and groundwater. The permit will require groundwater monitoring boreholes to be constructed to monitor the quality of the groundwater beneath the site. The on-going monitoring data will be compared to the baseline data. In the unlikely event that changes in quality are detected that can be attributed to any activities on the site, then action will be required to remediate any impact.

The environmental risk assessment includes details of how spillages will be reduced or avoided and how the risks from potential spillages are going to be minimised. The extractive waste transfer and storage activities will take place on an impermeable surface with individual containment around tanks.

Surface water will be contained and will be removed off site by tanker to an appropriate facility. Spillages to surface water will be prevented by the site drainage system. See section 6.11 of this document and section 9.2 of the WMP.

Spillages during transport outside the permitted site boundary are outside the scope of the permit, but are subject to other regulatory controls (Duty of Care).

Monitoring

Concerns were raised as to how the activities will be monitored in terms of identifying baseline values, and throughout the operations. Questions were raised as to whether the stated frequency of monitoring is correct, what would happen if landowners withdrew permission to use their boreholes, whether the monitoring would be independent and whether members of the local community would be able to attend Environment Agency inspections of the site.

Baseline monitoring will be carried out by the Applicant for ambient air, groundwater and surface water. We have specified monitoring requirements in the permit for groundwater.

For monitoring of radioactivity (NORM) refer to the decision document for permit application EPR/KB3098DE/A001.

Monitoring will be carried out by the Operator as described in their Emissions Monitoring Plan (EMP) which will be approved by the Environment Agency as required by a pre-operational condition. The frequency, parameters and duration of monitoring will be set out in the EMP.

It has been commented on that the Infrastructure Act would require 12 months of monitoring of methane in groundwater for high volume fractures, and therefore the environmental permit cannot be granted until this monitoring is carried out. Only 1 of the proposed 5 fractures would fall within the remit of this Act. The requirements of the Infrastructure Act are not yet made in law, and the Act is not enforced by the Environment Agency. The grant of an environmental permit does not mean the Operator can hydraulically fracture if they have not fulfilled the requirements of all other regulatory bodies.

The arrangements between the Operator and landowners for access to groundwater monitoring boreholes is outside the remit of the Environment Agency; the Operator must ensure they have measures in place to deal with this and to have alternative borehole locations identified if necessary.

Site inspections would be carried out by warranted Environment Agency Officers, it would not be possible to include members of the public. Monitoring by the Operator, the Environment Agency or a third party must adhere to the MCERTS monitoring scheme, and only use MCERTS accredited laboratories for the analysis.

There is an independent baseline monitoring scheme for radon proposed jointly by the British Geological Survey (BGS) and Public Health England.

Waste water treatment – disposal

Concerns have been raised that the Waste Management Plan does not contain an adequate level of information addressing the potential risks associated with chemicals generated from the proposed activities and that there is not enough treatment capacity available to deal with flowback fluid that will be produced from the proposed activities.

We have assessed the WMP and we are satisfied that the generation of waste will be minimised. Our approval of the WMP is subject to conditions, the requirements of any conditions in the permit will override any conflicting details in the Waste Management Plan.

We have assessed the Application and we are satisfied that the waste can be safely dealt with. Capacity will always be a limiting factor, so if an appropriately permitted outlet for the waste cannot be found, the operations will have to stop.

For this permit application the Operator is not required to advise us which facility they will send their waste water to for treatment. The Operator has a Duty of Care to ensure the facility they use has the appropriate environmental permits and can accept the waste water delivered to them. This information is required however for the determination of the RSR application EPR/KB3098DE/A001, and is assessed accordingly.

The receiving waste water treatment facility will require information on the composition of the waste water before accepting it for treatment, and therefore will be certain they can deal with all constituents of the waste water.

Reinjection of flowback fluid for disposal

Concerns were raised that some of the flowback fluid would be disposed of by reinjecting it back into the underground strata, which may eventually cause pollution.

The operator is restricted to activities described only in the WMP, which do not include the discharge of waste hydraulic fracturing fluid or flowback fluid to land (via injection) for disposal.

We have also included a permit condition that prohibits injection of any component of flow back fluid for the purpose of disposal.

Emergency planning

A number of comments were made regarding the lack of emergency planning in case of a severe accident on site or health impacts on the local community.

This facility does not meet the criteria for a Category A mining waste facility as detailed in the Mining Waste Directive; as such an emergency plan is not required. However the permit requires the Operator to have an appropriate accident management system, and we will be checking that they comply with their permit conditions as part of our compliance work. This management plan will include avoidance of accidents, the management of potential accidents and the minimisation of their consequences.

The Health and Safety Executive and Public Health England have been consulted and have not raised any concerns relating to emergency planning.

A comment was made about the apparent lack of emergency exit to the north of the site through the sound attenuation barrier; although this is a Health & Safety Executive matter, the Operator confirms this point has been considered and an exit will be in place.

Lack of flaring

We have received comments on the fact that there is no flare on this site to combust and dispose of gas. The concerns being what would happen if there was a build up of pressure in the well.

This site has an outlet for the gas; all gas will be piped to Knapton Generating Station for use in the gas turbine to generate electricity for the National Grid. Disposing of the natural gas via a flare, is not considered to be BAT where there are other options available for its use as in this case.

As the natural gas flows to surface, the Operator will monitor and record flow rate and pressure, giving them a greater understanding of the likely volume of natural gas in place within the formation. The well pressure will be monitored and if pressure were to build up it could be managed at the surface. The gas flow is controlled by a choke valve. The well casings, wellhead and pressure control equipment are designed and constructed to contain any expected well pressures and are designed in such a way that the well can be shut in and isolated if required.

Radioactive waste & Radon

Several comments raised concerns on how the radioactive substances generated from the activity will be managed. The Applicant has applied for a radioactive substances activity (RSR) permit that will deal with the management of naturally occurring radioactive materials (NORM) that may arise from the proposed activities. Issues relating to the management of radioactive materials raised as part of this application consultation have been shared with the relevant officers and will be considered under the RSR permit EPR/KB3098DE/A001.

Solid waste

Comments were submitted regarding the amount of solid waste produced during the flow-test stage and whether this waste would be radioactive or toxic in any way. The wastes are described in section 5.1.3 of this document and detailed in the WMP. All wastes have been classified as non-hazardous and we are satisfied that this assessment is correct.

Assessment of financial provision

Comments were made which raised concerns on the absence of monetary provision

that could be set aside and which could be used for any remedial work required in the event of a pollution incident.

The requirement in the MWD for financial guarantee does not apply to all activities. It only applies to a waste facility for hazardous waste or a Category A facility, neither of which apply in this case. We therefore have no power to require financial provision. See sections 5.1.4 and 7.10.1 Article 14 of this document for further details.

Earth tremors/Seismic activity

Concerns were raised that hydraulic fracturing could cause earthquakes. Some of the respondents pointed to previous earth tremors that were experienced on the Fylde coast in the Blackpool area as a result of hydraulic fracturing.

We have considered the risk of seismicity in relation to the potential impact on the permitted activities, including the integrity of the well, and we are satisfied that appropriate measures will be in place to ensure that seismicity will not cause harm to human health from the permitted activities.

Precautions against seismic activity are addressed by conditions on permissions for hydraulic fracturing that are granted by the Department of Energy and Climate Change (DECC). DECC oversee the implementation of precautions to prevent the occurrence of earth tremors as a result of hydraulic fracturing.

The Royal Society and the Royal Academy of Engineering conducted an independent review of the scientific and engineering evidence on the risks associated with hydraulic fracturing for shale gas. Its report, published in June 2012, concluded that the environmental (and health and safety) risks can be managed effectively in the UK, provided that “operational best practices are implemented and enforced through regulation”. The Government has accepted all of the recommendations from the report. The oil and gas industry is not new to the UK, it is the process of high volume hydraulic fracturing that is new and which is being closely monitored.

In 2011 there were small tremors at Preese Hall near Blackpool, where hydraulic fracturing operations were taking place. DECC suspended all hydraulic fracturing operations while investigating the cause. Following these investigations, in 2012 DECC introduced new controls and checks for operators intending to hydraulically fracture. Amongst other things, the operators are required to monitor seismic activity during and after fracturing and adopt a “traffic light” system that controls whether injection can proceed or not, based on the these checks. Any hydraulic fracturing must stop when tremors higher than the threshold agreed in the approved Hydraulic Fracture Plan (HFP) are detected.

This level is well below what could be felt at the surface and is within the range of normal background noise caused by vehicles, trains and farming activities. DECC have since produced a report that addresses concerns that have arisen from activities at Preese Hall and which outlines measures taken to reduce the risk of hydraulic fracturing related tremors.

We have included a pre-operational condition stating that hydraulic fracturing shall not commence until we have approved in writing, the relevant parts of the HFP which is referred to in section 4.3.2 of the WMP. See section 7.6 of this document for further information.

Impact on Wildlife

The potential impact on wildlife has been raised during the consultation; the site already exists and there will be no further drilling; therefore there will be no additional impact on wildlife in the immediate area.

We have carried out our statutory duty in assessing local habitats and species as described in section 7.10.2, parts i), j), and k). We are satisfied with the conclusion that there will be no impact on wildlife from the activities regulated by this permit.

Light pollution

There will be light sources on the wellsite for the 24 hour operations; the requirements for appropriate lighting and types of lights to be used to minimise the potential impact on local receptors is a matter for the planning authority.

Suitability of the Risk Assessment

Concerns have been raised about the adequacy and impartiality of the Applicant's risk assessment and whether it identified all the risks and categorised them correctly.

We have reviewed the assessment, and we are satisfied that it complies with our relevant guidance and that it identifies and covers all appropriate risks and that measures are in place to address them.

Impact on property values

A number of comments have been made that the proposed activities will have a negative impact on property values in the local area.

The potential impact of the proposed activity on property values in the local area is not relevant to the determination for environmental permit applications.

Perforation of the well

Concerns were raised about the explosive charges that are to be used in perforating the well during the fracking operation. Questions arose such as, what explosives are to be used in this process, and what risks they present. Also, how are these to be transported to the site and stored on-site. Questions were asked about the company or sub-contractor employed to do the fracking.

The preparation of the well for the fracturing operations is not regulated by this permit; although this information will be included in the HFP (see section 7.6 of this document), which will require approval prior to the fracturing operations commencing. The company carrying out the hydraulic fracturing has not been named, although the Operator retains overall control and responsibility for the activities being carried out on site.

Pipeline

Comments were received regarding the pipeline that is to carry the shale gas from the Kirby Misperton site to Knapton Generating Station, in particular, the potential for leaks and where responsibility lies for inspection and maintenance of the pipe.

The pipeline that runs between Knapton Generating Station and KM8 wellsite is the responsibility of Third Energy. Knapton Generation Station is a separately permitted site and will continue to manage its related infrastructure in the same way to ensure no gas is lost from the pipework to maximise electricity production.

The control of this pipeline is outside the remit of this waste and groundwater activity permit.

DRAFT

3 Other matters outside the scope of this permit Application that the public have commented on which may be more relevant to Applications for other permissions.

Hydraulic fracturing:

Concerns were raised that hydraulic fracturing is an extremely dangerous process with comparisons made to health and environmental impacts experienced in other countries thought by some to be attributable to hydraulic fracturing.

The permitted activities include the management of waste from hydraulic fracturing, whilst DECC issues permission that authorises the hydraulic fracturing process itself. However, we do regulate activities associated with hydraulic fracturing as outlined in the body of this document. We have addressed the risks of those activities and how we have dealt with them.

Permissions are granted based on guidance issued by the Government and bodies such as Public Health England.

We are obliged to work to current government guidelines and the legislation that is in place at the time the decision is to be made.

Location of the site and industrialisation of the countryside:

Decisions over land use are matters for the planning system. North Yorkshire County Council is responsible for determining whether or not the proposed development is appropriate in this location, having regard to relevant policies within the adopted local plan and the National Planning Policy Framework. The location of the site is a relevant consideration for Environmental Permitting, but only in so far as affects the potential for the site to have an adverse environmental impact on communities or sensitive environmental receptors. The environmental impact is assessed as part of the determination process and has been reported upon in the decision document.

Vehicle access to the site and traffic movements:

These are relevant considerations for the grant of planning permission, but do not form part of the Environmental Permit decision making process except where there are established high background concentrations of pollutants contributing to poor air quality and the increased level of traffic might be significant in these limited circumstances. This is not the case for this location.

Climate change policy

Policy is made by the Government and the policy on exploitation of Shale Gas is no different to that of any other fossil fuel. The 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".

Industry Self Regulation

Where an environmental permit is granted, we have a responsibility and a duty to ensure that it is complied with. Concerns about industry self-regulation are not relevant to our permit determination or the subsequent regulation of any permit.

The oil and gas industry is not new and has been producing oil and gas in the UK for many decades; as regulators of the refineries and combustion plants using this resource, we have extensive relevant experience.

We recognise that hydraulic fracturing is a new activity under the EP Regulations, however, the proposed activities are well regulated by legislation enforced by the Environment Agency, the Health and Safety Executive, the Planning Authority and DECC.

The waste management activities proposed for this site in terms of storage and processes for recovery and disposal, are well established and the risk management measures in place are commonly used across a variety of industries

The regulatory system that manages this industry and others has also been developed over many decades through global experience. Many of the regulations controlling this sector have been introduced in the last decade and are continually under review both in the UK and EU. What is new is the technique of high volume hydraulic fracturing, about which we have gathered regulatory information from around the world and particularly the US. This is the nature of industry as it develops new methods and techniques. To date there has only been one hydraulic fracturing event in the UK that has helped inform the requirement for permits to carry out all such activities.

We have stated from the outset that we will take a conservative approach and will require operators to fully risk assess their activities and demonstrate how risks will be managed and mitigated when applying for any permits. We have taken the same position in considering the permit conditions to include in this permit.

Additional Correspondence

In addition, we have received certain correspondence and representations submitted to the Planning Authority in response to the planning application. Although this has not been directly submitted to us as part of our consultation, we have carefully considered any issues raised in those representations that are relevant to determination of this permit application, and taken them into account for the purposes of our draft decision.