



Onshore oil and gas exploratory operations: technical guidance

Consultation Draft, August 2013

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We operate at the place where environmental change has its greatest impact on people's lives. We reduce the risks to people and properties from flooding; make sure there is enough water for people and wildlife; protect and improve air, land and water quality and apply the environmental standards within which industry can operate.

Acting to reduce climate change and helping people and wildlife adapt to its consequences are at the heart of all that we do.

We cannot do this alone. We work closely with a wide range of partners including government, business, local authorities, other agencies, civil society groups and the communities we serve.

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What's this guidance about?

This guidance explains which environmental regulations apply to operations to explore for onshore oil and gas in England and the permissions you'll need to obtain. It includes activities with a technical connection to the exploration work which could lead to emissions and pollution.

Examples of such activities are:

- raw material storage and handling
- all aspects of waste management (prevention, recovery, safe disposal)
- systems to control and reduce emissions to land, air and water

The guidance does not cover the commercial extraction of oil and gas or underground coal gasification.

The guidance is for oil and gas companies, their consultants and other technical audiences like land use planners. It is not aimed at operators drilling exploratory boreholes for other purposes, including exploration for minerals other than oil and gas.

The document either directs you to existing Environment Agency advice and guidance, or explains how existing legislation and guidance apply to exploratory oil and gas operations. Advice is given on our overall permitting approach to oil and gas exploratory activities. Permitting decisions on individual sites will be based on site-specific conditions.

We'll be reviewing this guidance document regularly so please check you're using the most up-to-date version.

This guidance is partly based on our Environmental Risk Assessment of shale gas exploratory operations. You can download this from our [publications catalogue](https://publications.environment-agency.gov.uk/skeleton/publications/default.aspx) (<https://publications.environment-agency.gov.uk/skeleton/publications/default.aspx>).

Finding your way around this guidance

The [Appendix](#) contains a flow diagram to help you navigate your way through this guidance. The left-hand side of the diagram shows the different stages of operations while the boxes on the right contain hyperlinks to the relevant sections of this guidance. While this means some permissions appear in the diagram more than once, you'll only need to apply for each permission once for a particular site. The flow diagram isn't a timeline showing when to apply for each permission and shouldn't be used in that way.

Other sources of useful information

This guidance makes frequent references to the Environmental Permitting (England and Wales) Regulations 2010 (EPR 2010) so you may find it helpful to [consult Defra's core guidance on environmental permitting](http://www.gov.uk/government/publications/environmental-permitting-guidance-core-guidance--2) (www.gov.uk/government/publications/environmental-permitting-guidance-core-guidance--2). Details of specific Environment Agency guidance on permitting are given in the relevant sections. You may also find it useful to:

- download the 'UK Onshore Shale Gas Well Guidelines', available from the [UKOOG website](http://www.ukoog.org.uk) (www.ukoog.org.uk), which set out non-binding good practice in this area
- look at the guidelines on the [Oil & Gas UK website](http://www.oilandgasuk.co.uk) (www.oilandgasuk.co.uk) that apply to both the onshore and offshore oil and gas industry

What do we require from you?

The various activities involved in exploration for oil and gas at onshore sites in England fall under different pieces of legislation. This means we could potentially require nine applications from you, though we plan to combine some of these into a single process. Five of the applications fall under EPR 2010 and are therefore handled using this single regulatory framework, while the others fall under different regulatory regimes. Therefore we could require from you:

- a notice to be served on us under section 199 of the Water Resources Act 1991 to 'construct a boring for the purposes of searching for or extracting minerals'
- environmental permits for:
 - a groundwater activity – unless we're satisfied there's no risk of inputs to groundwater
 - a mining waste activity – likely to apply in all circumstances
 - an installation under the Industrial Emissions Directive – when you intend to flare more than 10 tonnes of waste gas per day
 - a radioactive substances activity – likely to apply in all circumstances where oil or gas is produced
 - a water discharge activity – if surface water run-off becomes polluted, for example, due to a spill of diesel or flowback fluid
- a groundwater investigation consent – to cover drilling and test pumping where there's the potential to abstract more than 20 cubic metres per day (m³/day)
- a water abstraction licence – if you plan to abstract more than 20 m³/day for your own use rather than purchasing water from a public water supply utility company
- a flood defence consent – if the proposed site is near a main river or a flood defence

We strongly advise you to:

- discuss the requirements of all relevant permissions with us at the pre-application stage
- twin-track your planning and environmental permission applications

The risks to the environment from exploratory oil and gas operations are likely to be different to those from commercial exploitation. In some cases the legislative requirements at the exploration stages are less than those that apply at the exploitation stage. Depending on the site and proposed operation, additional requirements and controls may be required for commercial exploitation. You may need to apply for further permits or vary the permits you hold if you move from exploration to commercial exploitation. You might want to consider applying for permits that go beyond the exploration stage and satisfy the full legislative requirements at the outset to:

- give you the maximum flexibility in the way you conduct your operations
- minimise any uncertainty over the scope of exploration.

What permissions do other organisations require?

You can find out about the permissions required for exploration for unconventional oil and gas onshore in the UK by looking at the roadmap due to be published in due course by the Department for Energy and Climate Change (DECC) and other UK regulatory authorities. Much of the information applies equally to conventional oil and gas exploratory activities.

For example, the British Geological Survey (BGS) requires information on:

- any borehole that is intended to penetrate to a depth greater than 100 feet (30.5 metres)

- the deepening of an existing well

If you carry out such an operation, the BGS requires you to:

- keep a record in the form of logs and cores or fragments for a period of six months
- allow its officers access at all reasonable times

Land use planning applications and Environmental Impact Assessments

We are likely to be a statutory consultee in the land use planning process for planning applications for exploratory operations. The details are set out in the Town and Country Planning (Development Management Procedure) (England) Order 2010 and the Town and Country Planning (Environmental Impact Assessment) Regulations 2011.

Our [external planning consultation list](http://www.environment-agency.gov.uk/research/planning/33368.aspx) (www.environment-agency.gov.uk/research/planning/33368.aspx) sets out when we want to be consulted. We will discuss proposals for onshore oil and gas exploration with, and provide advice to, the Mineral Planning Authority. We engage with developers and Mineral Planning Authorities from the pre-application enquiry stage through to planning applications and the formal discharge of any relevant conditions.

We take a 'yes if' approach to planning. We avoid objecting where we can. Where we raise an initial objection, we request further information, encourage dialogue and suggest solutions for the developer to consider which may then allow us to remove our objection.

When a planning development also needs an environmental permit, we advise the Mineral Planning Authority on the issues covered through environmental permitting.

Land use planning and permitting guidance

[Read our guidance for operators planning a development requiring planning permission and environmental permits](http://www.environment-agency.gov.uk/business/regulation/139378.aspx) (www.environment-agency.gov.uk/business/regulation/139378.aspx) to understand our role in the planning and permitting processes and how we'll advise on developments covered by both. Our aim is to streamline the advice given at the planning and permitting stages to ensure a 'joined up' approach is taken where more complex issues exist.

You may need to submit some of the technical documentation supporting your planning and environmental permitting applications to both ourselves and the Mineral Planning Authority. For onshore oil and gas exploration, we strongly recommend 'parallel tracking' of environmental permits and planning applications. This will help to minimise delays due to the complex interactions between the two. We will also want to see the documents that cover the requirements of DECC and the Health and Safety Executive (HSE), though these may be included in submissions to the Mineral Planning Authority.

Pre-application advice

We provide advice on potential development proposals prior to the formal planning application stage. We recommend you consult us early on so we can highlight any issues at an early stage.

We are aiming to introduce a voluntary, chargeable planning pre-application advice service. This will involve us providing a free preliminary opinion on development proposals. For more complex proposals we are likely to suggest that developers pay a fee to receive more detailed technical advice. Some oil and gas exploration activities may fall into this category of proposals. We plan to

pilot the new service in our Midlands Region during autumn and winter 2013, with rollout nationally by January 2014.

We recommend you contact the Sustainable Places Team at our local office for site-specific advice on your pre-application or [fill in our pre-application enquiry form](http://www.environment-agency.gov.uk/research/planning/33580.aspx) (www.environment-agency.gov.uk/research/planning/33580.aspx).

At this stage you should inform us of your proposed operations, including the method of borehole construction, the chemicals you propose to use for drilling and, if applicable at this point, those you propose to use for well stimulation. You should also state this information in your planning application.

Environmental Impact Assessment

Some types of project will automatically require an Environmental Impact Assessment (EIA) and certain others will require one if they're likely to have significant environmental effects. Where an EIA is required it should be submitted to the Mineral Planning Authority as part of the planning application process.

Onshore oil and gas exploratory drilling operations may fall under schedule 2(d) (extractive industry) to the Town and Country Planning (Environmental Impact Assessment) Regulations 2011. An EIA is only required by the Mineral Planning Authority if the particular project falls within the applicable thresholds and criteria of schedule 2, and is judged likely to have significant environmental effects based on the screening criteria given in schedule 3.

We strongly advise you to find out if an EIA is required for your operations before you apply for environmental permits. There may be a delay in determining your permit applications if it subsequently turns out you need an EIA.

You should contact the Mineral Planning Authority for a formal screening opinion to determine whether an EIA is required. We don't have a statutory role at this stage, but if asked by the Mineral Planning Authority, we may provide a screening opinion based on the potential effects of the proposed operation that are relevant to our remit.

If an EIA is deemed necessary, you can request a scoping opinion from the Mineral Planning Authority. We are a statutory consultee for scoping opinions and will advise you and the Mineral Planning Authority. The most important outcome of scoping is to agree what issues should be included in the EIA process and how these issues should be assessed. Similar information may be required as part of the permitting process and, where these applications are run in parallel, complementary information can be collated and presented for the different regimes.

Our [EIA scoping guidance](http://www.environment-agency.gov.uk/research/policy/33013.aspx) (www.environment-agency.gov.uk/research/policy/33013.aspx) consists of a handbook (Part A), two Part B generic effects guides and various Part C sector effects guides. After reading the handbook we recommend you refer to both Part B generic effects guides and the Part C2 sector effect guide for the extractive industry. Part C2 contains a list of the specific issues we would expect to see in an EIA for an onshore oil and gas exploration site. This list is based on the documents produced by Arup and Lancashire County Council for Cuadrilla's Beconsall site and is summarised below:

- a description of the development including:
 - a full and detailed description of the physical characteristics and design of the whole development, its location and land use requirements during set up and operation
 - the main characteristics of the proposed operation including the nature, quantities, types of equipment, fluids, chemicals and materials to be used in construction and operation
 - an estimate by type and quantity of expected residues and emissions resulting from the operation of the proposed development

- a description of the management of the development to prevent soil and water contamination and consideration of cumulative, short-, medium- and long-term effects, both permanent and temporary
- a hydrogeological assessment of the potential impacts on groundwater and surface water, including the impacts on any aquifers or groundwater sensitive receptors, especially abstraction boreholes, using the following information:
 - the location of all surface and groundwater features in the area around the proposed development
 - the local and regional geological structures likely to be affected by the operations
 - the exact nature of any well stimulation fluids proposed
 - the proposed design of the borehole and drilling platform to prevent spills and leaks
 - the proposed methods of containment, treatment and disposal of any such spills and leaks
 - the potential for the migration of well stimulation fluids into sensitive geological formations including those containing groundwater
 - the methods to monitor any fluid migration and seismic activity, and the mitigation techniques to reduce the likelihood and magnitude of such events
- identification of the waste streams likely to be generated by the project, along with the predicted methods of recovery, treatment and disposal, focusing on:
 - well stimulation fluid remaining underground
 - flowback fluid
 - radioactive scale and sediments
 - waste gas
 - waste drilling muds and drill cuttings
- the likelihood of induced seismic activity occurring, the maximum possible magnitude of such activity and the equipment, both onsite and offsite, at risk of damage from seismic activity
- the requirement for water during the operation and the percentage of water that will be re-used or recycled
- an assessment of the risk of flooding from all potential sources
- an assessment of the impacts on sensitive ecological receptors i.e. European and nationally protected or notable species and habitats such as those designated under the Biodiversity Action Plan
- an assessment of the air quality impacts arising from the set up and development of the site – such impacts should be investigated in relation to the amenity of nearby sensitive receptors and should form part of a wider ecological assessment relating to any nearby designated sites
- an assessment of the impact of the development on emissions of greenhouse gases
- a monitoring and site management plan
- the inter-relationships between any of the issues identified above
- an indication of any difficulties (technical deficiencies or lack of know how) encountered by the applicant in compiling the required information

The planning application

We will be consulted when a valid planning application is received by the Mineral Planning Authority. We'll review the details of the application, including any relevant reports, and provide advice to the Mineral Planning Authority.

We may have no comment to make if a proposal is acceptable. We may recommend conditions or raise an objection. We'll ask for any further information to enable us to advise on matters within our remit at the earliest opportunity.

Having received all necessary information, we will object to a scheme if we consider the environmental risks to be unacceptably high despite proposals to mitigate them.

We will also object to a scheme if there is insufficient information to support the application. You can help to avoid this happening by following this guidance and by talking to us at the pre-application stage.

Planning appeals

Where a Mineral Planning Authority refuses a planning application and you appeal, or you appeal against a non-determination or the inclusion of certain planning conditions, we may provide expert advice on specific environmental issues during the appeal process.

Variation and discharge of planning conditions

If after the Mineral Planning Authority grants planning permission you apply for any variation or discharge of planning conditions which we recommended, we'll be consulted on the application.

For a variation of a condition we'll take into account the impact of the proposed changes and advise accordingly.

For a discharge of a condition, we'll review the submitted documents and advise on the acceptability of the proposals to help the Mineral Planning Authority decide whether they satisfy the planning condition.

As with other applications, we can provide advice before you submit your formal application for a variation to the Mineral Planning Authority. You are strongly advised to seek such advice.

Notice of intention to construct or extend a boring for the purpose of searching for or extracting minerals

Before drilling a borehole you need to provide us with a notice of intention under section 199 of the Water Resources Act 1991 (as amended by the Water Act 2003) by completing form WR11. You can obtain a copy of this form by calling us on 03708 506 506 or by contacting our local office.

We recommend that drilling should not begin until one month after notice is served. The only exception is in cases of emergency, which we believe is unlikely to apply to oil and gas exploratory operations. This time limit applies even when you have obtained all the other permissions from us and so we recommend completing form WR11 early on in the permitting process.

We will ask for a detailed Method Statement to accompany the WR11 form giving information on:

- well drilling
- well casing
- storage of substances including fuel and chemicals
- your proposed Drilling Mud Management Plan

See section 2.2.5 of our technical guidance, [IPPC S1.02 Gasification, Liquefaction and Refining Sector](#) (www.environment-agency.gov.uk/business/sectors/117155.aspx) for details of the types of measures we will be looking for to prevent fugitive emissions to surface water or groundwater from your proposed operations.

If you're applying for permission to both drill and stimulate a borehole, you'll need to include information on the chemicals you propose to use in the well stimulation process in the Method Statement and form WR11. This will allow us to decide whether the proposed borehole construction, casing and completion are adequate to prevent unacceptable risks to the environment.

If we don't consider the information provided in the Method Statement and form WR11 to be sufficient, we can serve a notice on you under section 201 of the Water Resources Act 1991 asking for more information. After receiving the necessary information, we could serve you with a conservation notice under section 199 of the Water Resources Act 1991 to allow us to require changes to your proposal to safeguard water resources. The serving of a conservation notice isn't generally necessary as we would discuss the proposal with you first to enable you to deal with our concerns in a revised Method Statement.

Environmental permits

Pre-application discussions for all environmental permissions

We recommend you go through the requirements of each potential application with us at the pre-application stage so that you can eliminate those permissions that don't apply and understand what information is required for those that do. This will save us and you time and money when the relevant applications are submitted. If we don't have the necessary information, we will either not accept the applications or will have to go back to you to request more information.

Any specialist contractors you appoint will need to be able to demonstrate to us that they have the appropriate level of expertise for the particular site or sites in question. It's important you understand at the pre-application stage what information will be required to do this. For example, we would want to be sure that a contractor has previous experience of drilling through highly fractured chalk if this was the geology present at a proposed site.

Applying for environmental permits and variations

When applying to us for an environmental permit or a permit variation, you need to complete sections A and F of the application form as well as other sections depending on the permits or variations being applied for. Visit our web page, [Making an application](http://www.environment-agency.gov.uk/business/topics/permitting/32318.aspx) (www.environment-agency.gov.uk/business/topics/permitting/32318.aspx), for links to application forms and guidance on completing them. In particular, our guidance states that "the 'site' means all the land the facility occupies". Our view is that in the case of onshore oil and gas exploratory operations this refers to the land occupied at the surface as it is from here that control over potential environmental impacts takes place.

We issue two types of permits.

- **Standard permits** use a set of standard rules for a particular type of activity to provide the necessary level of environmental protection. The rules may include restrictions on such things as size or location.
- **Bespoke permits** set conditions for activities where we have not or cannot develop standard rules, for example because the necessary controls are too complex.

All onshore oil and gas exploration sites currently require bespoke permits, although we're aiming to produce a standard rules permit in the near future.

When we receive a permit application, we check it is complete – the term 'duly made' is used to describe this point in the process. We expect you to have followed our pre-application advice as

well as this guidance when completing your applications. Failure to do so will result in applications being returned as 'not duly made'.

Once an application is 'duly made', we will consider (we use the word 'determine') it. This includes putting details of the application on the public register and publicising them (including on our website) for public consultation. Only comments directly relevant to the permit are taken into account when determining the application. Other comments will not be considered.

It may take longer to determine the application if a site is declared to be of 'high public interest' because we will provide more opportunity for public scrutiny. More information on this process is given in our [public participation statement](http://www.environment-agency.gov.uk/business/topics/permitting/36420.aspx) (www.environment-agency.gov.uk/business/topics/permitting/36420.aspx) and our [Regulatory Guidance Note 6: Determinations involving sites of high public interest \(PDF, 110 KB\)](http://publications.environment-agency.gov.uk/pdf/GEHO1111BUKC-E-E.pdf) (http://publications.environment-agency.gov.uk/pdf/GEHO1111BUKC-E-E.pdf).

Given the current level of public interest in unconventional gas and oil exploration, it's likely that we will treat such sites as being of high public interest. Conventional oil or gas exploration is unlikely to be considered high public interest as the industry is well established in England.

Where a site is defined as of high public interest, the consultation is tailored to local circumstances and may include:

- extending the time allowed for public consultation on the permit application
- wider advertising (for example in local newspapers) or holding drop-in sessions
- a second public consultation on the draft decision on the application

In these cases, the non-statutory 13-week determination timescale for environmental permits does not apply. For a bespoke permit application where there is a lot of public interest, determining a permit may take four to six months from when the application is duly made. The process can be shorter or longer. The main factors affecting the timeframe are the quality of the application and how locally contentious the site is. Good quality applications and local support through effective engagement generally result in faster determinations and more effective public consultations.

Final decisions are published on the public register.

The law requires us to recover our costs for permitting and inspection. There are separate government-approved charges for obtaining a permit and our subsequent work in ensuring compliance with its conditions. [Read more in our guidance on the charging scheme](http://www.environment-agency.gov.uk/business/regulation/138519.aspx) (www.environment-agency.gov.uk/business/regulation/138519.aspx). Please contact us for advice if you've not sure which charges apply to you.

Environmental permit for a groundwater activity

Groundwater Protection: Principles and Practice (GP3)

We aim to prevent pollution of groundwater in the first place rather than having to restore it later. Our [GP3 document](http://www.environment-agency.gov.uk/research/library/publications/144346.aspx) (www.environment-agency.gov.uk/research/library/publications/144346.aspx) describes the approach we take to protecting groundwater and makes the following statement about unconventional gas:

'We wish to facilitate development of sustainable sources of energy, working in partnership on initiatives where appropriate. However, we will object to ... shale gas extraction infrastructure or activity within SPZ1 [Source Protection Zone]. Outside SPZ1, we will also object when the activity would have an unacceptable effect on groundwater.'

It also makes the following statement about conventional gas and oil exploration:

'We will object to such hydrocarbon exploration, extraction infrastructure or activity within SPZ1. Outside SPZ1, we will also object when the activity would have an unacceptable effect on groundwater. Where development does proceed, we expect BAT [Best Available Techniques] to protect groundwater to be applied where any associated drilling or operation of the boreholes passes through a groundwater resource. Elsewhere, established good practice for pollution prevention should be followed.'

SPZs identify those areas close to drinking water sources where the risk associated with groundwater contamination is greatest:

- SPZ1 inner source protection zone – extent defined by 50-day travel time of groundwater from the borehole and a minimum 50 metre radius
- SPZ2 – 400-day travel time
- SPZ3 – full catchment

There should be no drilling activity within an SPZ1, although horizontal drilling deep below the base of this aquifer may be acceptable.

Near-surface aquifers are divided into 'groundwater bodies' for management purposes under the Water Framework Directive. Under article 7 of this directive all groundwater bodies in England are identified as drinking water protected areas (that is, where the water resource is currently used or may be used in the future as a source of drinking water). Our aim is to prevent deterioration in water quality in these areas to avoid any increase in the treatment of drinking water that may be abstracted.

Groundwater currently used as a resource or which provides flow to surface waters and wetlands, or may be used as a resource in the future, must have a high degree of protection. A high level of protection also extends to some deep formations that contain groundwater that would be suitable for use following treatment if necessary, or which may be used for artificial storage and recovery.

Our priority is to protect water supplies intended for human consumption as well as ensuring protection of groundwater that supplies dependent ecosystems. We apply progressively more stringent controls as the sensitivity of the location increases, so greater controls apply the closer an activity is to an abstraction source.

Where development does proceed, we expect established good practice in groundwater protection to be applied where any associated drilling or operation of the boreholes or shafts passes through a groundwater resource.

Depending on the potential severity of the hazard, we will object through planning or our permitting controls to certain activities in some areas. Close to sensitive receptors we're likely to adopt the precautionary principle, as the consequences may be serious or irreversible even when the likelihood of pollution occurring is not high.

Environmental permitting of groundwater activities

Groundwater activities are covered by schedule 22 of EPR 2010. We expect you to inform us of any activities that could involve the discharge of pollutants into groundwater (a 'groundwater activity') and the nature of these pollutants, so that we can decide whether the activity needs to have a permit. We have powers under regulation 60 of EPR 2010 to require such information.

Regulation 2 defines a 'pollutant' as 'any substance liable to cause pollution' and 'pollution' as:

'In relation to a water discharge activity or groundwater activity, [pollution] means the direct or indirect introduction, as a result of human activity, of substances or heat into the air, water or land which may—

- (a) be harmful to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems
- (b) result in damage to material property
- (c) impair or interfere with amenities or other legitimate uses of the environment'

Where injected fluids contain pollutants that might enter groundwater, directly or indirectly, this constitutes a groundwater activity under paragraph 3 of schedule 22 to EPR 2010 and is subject to the permitting process. In the case of well stimulation, we will normally expect there to be a groundwater activity unless you can demonstrate this would not be the case. This is because there might be a risk of inputs to groundwater.

There must be no direct discharge of pollutants into groundwater. The indirect entry of non-hazardous pollutants must be limited so as not to cause pollution.

You must inform us of the chemicals you propose to use in your activities so that we can assess whether a substance is hazardous (see [Assessment of the chemicals used for well stimulation](#)). We expect you to propose only non-hazardous substances for use.

If the target formation doesn't contain any significant groundwater or is so deep that it falls outside any hydrogeologically active zone, we may determine there is no groundwater activity to permit. However, a permit will be required if we consider well stimulation might lead to the movement of pollutants into adjacent groundwater that would not otherwise have received them. Pollutants in this case might be substances introduced by your operations or the mobilisation of natural substances like hydrocarbons from the target formation. We will apply reasonable judgement as to whether it's necessary to regard this as a groundwater activity. In particular we will consider the possibility of:

- cross-contamination of other aquifers caused by tracking behind the borehole casing or leakage from the borehole casing
- cross-contamination of other aquifers caused by either the injected fluid or the flowback fluid
- impacts on groundwater-dependent receptors near the surface works

Even if we initially take the view a groundwater permit isn't necessary, if new information suggests there is a risk to groundwater we can serve a prohibition notice on you or require you to apply for an environmental permit for a groundwater activity. Schedule 22 to EPR 2010 makes it clear we can do this.

For more information [see our guidance on groundwater permitting](http://www.environment-agency.gov.uk/business/topics/water/117529.aspx) (www.environment-agency.gov.uk/business/topics/water/117529.aspx).

A permit application should include a detailed evaluation of any risks to groundwater and the proposed measures to prevent the input of hazardous substances and to limit the input of non-hazardous pollutants so as to ensure such inputs do not cause pollution of groundwater (paragraph 6 of schedule 22).

You must provide us with all the relevant details including:

- a conceptual model showing the hydrogeological relationship between the zone of interest and any overlying or adjacent aquifers
- the method of well construction, including details of the casing and grouting
- information on how the integrity of the casing is to be tested
- information on the location of the proposed operation and where the well stimulation fluid is expected to travel to
- details of the liquids to be injected, water ingress, water use and disposal of effluents
- details of any chemicals added in the process or substances used to prop open fissures
- safeguards to prevent cross-contamination of aquifers

- safeguards to prevent uncontrolled loss of fluids in the borehole to formations or ground surface (blowouts)
- potential quality risks to receptors and groundwater resources
- details of how the operation itself is to be monitored
- proposed environmental monitoring (including monitoring groundwater and surface water receptors)

Paragraph 7 of schedule 22 covers the analysis we need to apply to set permit conditions ensure the environmental objectives of article 4 of the Water Framework Directive are met (that is, good chemical status, no deterioration in status, and reversing significant and sustained upward trends of pollutants). This is a general requirement for any groundwater discharge. [Read Defra's environmental permitting guidance: groundwater activities](http://www.gov.uk/government/publications/environmental-permitting-guidance-groundwater-activities) (www.gov.uk/government/publications/environmental-permitting-guidance-groundwater-activities) to find out more on this and other aspects of groundwater permitting.

Paragraph 8 states that:

‘...the regulator may grant an environmental permit for—

(a) the injection of water containing substances resulting from the operations for exploration and extraction of hydrocarbons or mining activities, and injection of water for technical reasons, into geological formations from which hydrocarbons or other substances have been extracted or into geological formations which for natural reasons are permanently unsuitable for other purposes, provided that the injection doesn't contain substances other than those resulting from the above operations’

The intention of this clause is to allow for the return of water naturally present in geological formations. The European Commission's opinion is that this provision does not apply to shale gas operations. It is understood that this is because the water resulting from shale gas activities is expected to consist mainly of flowback fluid rather than naturally occurring formation water.

What this means in practice is that, where produced water consists of formation water (as is normally the case in conventional oil and gas activities), this can be re-injected into the formation to stimulate production or, subject to permitting, be disposed of. However, it doesn't mean that flowback fluid from hydraulic fracturing cannot be reused. If the fluid, which is a waste when it returns to the surface, can be treated to the point where it performs the same function as fresh injection fluid, it will no longer be a waste and can be used in well stimulation. We will need to assess any proposal to reuse flowback fluid in this way.

Assessment of the chemicals used for well stimulation

We will assess whether a substance proposed for use in well stimulation is hazardous or a non-hazardous pollutant using a [methodology that follows the requirements of the Groundwater Daughter Directive](http://www.wfduk.org/legislative-background-and-classification-results) (www.wfduk.org/legislative-background-and-classification-results). Our assessments are peer-reviewed by the Joint Agencies Groundwater Directive Advisory Group made up of representatives of the UK environment agencies, the Environmental Protection Agency of the Republic of Ireland, the Health Protection Agency, Defra, the Welsh Government and industry. The Group oversees assessments and consults publicly on proposed determinations before adopting these, with amendment where necessary.

Although many chemicals have been used for well stimulation and particularly for high volume hydraulic fracturing in the USA, we will only review those proposed for use in England. Operators will not be able to use chemicals for well stimulation unless we consider them acceptable for use.

Allowing the use of a chemical at one site does not automatically mean we will allow it to be used elsewhere because the environmental risks may be different, for example, due to local geological conditions.

In the interests of transparency, we list below the chemicals assessed as non-hazardous and allowed for use at Cuadrilla's Preese Hall site, where well stimulation involving the use of high volume hydraulic fracturing took place. The chemicals were:

- glutaraldehyde – used for bacterial control, although it wasn't required as mains water was used at the site
- polyacrylamide – used to reduce friction when pumping to depth
- dilute hydrochloric acid – commonly used to remove any buildup of scale inside a well

You should keep us informed of the nature and quantities of the chemicals you propose to use in the well stimulation process, including carrier fluids, at the pre-application and planning application stages. You should confirm your proposals at the permitting stage.

If you apply for permission to drill and to stimulate a borehole at the same time, you should include information on the chemicals you propose to use in the Method Statement and form WR11. This will allow us to consider whether the proposed borehole construction, casing and completion are adequate.

Decommissioning boreholes

You expect you to discuss your proposals for decommissioning exploration wells with us. Decommissioning must ensure that there is no risk – even in the very long term – to any geological formations that contain groundwater and which require protection under the Water Framework and Groundwater Daughter Directives.

[Download 'Good Practice for Decommissioning Redundant Boreholes and Wells' from our publications catalogue](https://publications.environment-agency.gov.uk/skeleton/publications/default.aspx) (<https://publications.environment-agency.gov.uk/skeleton/publications/default.aspx>) for advice on how to decommission any groundwater abstraction and monitoring boreholes installed at your site.

See also [Guidance on protection of groundwater and the Waste Management Plan](#).

Environmental permit for a mining waste operation

Although the terms 'exploration' and 'exploitation' are common within industry and some regulatory regimes, the Mining Waste Directive uses the terms 'prospecting' and 'extraction'. But while similar, the terms are not synonymous. 'Prospecting' appears to be more restrictive than 'exploration', which is commonly regarded as covering all stages prior to commercial development.

The Mining Waste Directive requires that extractive wastes are managed in a way that minimises harm to human health and the impact on the environment. It covers the management of waste resulting from the prospecting, extraction, treatment and storage of mineral resources and working of quarries, which it refers to as 'extractive waste'. The waste can be solid, liquid or gas and both oil and gas are defined as minerals.

Under EPR 2010 an environmental permit is required to authorise a mining waste operation. A 'mining waste operation' is defined in schedule 20, paragraph 2(1) as the 'management of extractive waste, whether or not it involves a waste facility'.

Types of mining waste operation

Our view is that well stimulation will always involve the creation of a waste facility unless the stimulation is carried out using only produced water that is not waste. A waste facility is an area designated for the accumulation or deposit of extractive waste. In the case of a non-hazardous, non-inert waste, an area would need to be designated for intended use of more than one year to become a facility.

A proportion of the well stimulation fluid injected will be left behind in the target formation. At the point it no longer serves a useful purpose, the liquid left will be waste. The fractures in the target formation will therefore form an area designated for the deposit of such waste.

The Mining Waste Directive contains a derogation from the additional requirements imposed on a mining waste facility where the waste deposited is non-hazardous waste from prospecting for mineral resources. However, this derogation does not apply to the prospecting of oil and evaporites, other than gypsum and anhydrite, and only applies to the prospecting of gas where we are satisfied that the objectives of article 4 of the Mining Waste Directive will be met. Put simply, these are to ensure that you take all necessary measures to prevent or reduce as far as possible any adverse effects on the environment and human health brought about as a result of the management of extractive waste. You will need to demonstrate this is the case via a Waste Management Plan accompanying your permit application. We will impose permit conditions requiring any necessary measures to be implemented if we deem your Waste Management Plan indicates a need for them.

‘Prospecting’ is defined by article 3(21) of the Mining Waste Directive as:

‘the search for mineral deposits of economic value, including sampling, bulk sampling, drilling and trenching, but excluding any works required for the development of such deposits, and any activities associated with an existing extractive operation’.

In our view the mining waste activities carried out during onshore oil and gas exploration will fall within the definition of prospecting if they can objectively be considered as an operation to establish the presence, nature and quality of the hydrocarbon reserves and to ascertain that they have economic value. If activities go beyond this and move into pre-production development or full commercial development, this will no longer be considered to be prospecting and the derogation will not apply. Any permit we issue at the exploration phase with the benefit of the derogation will be limited to the management of waste from prospecting. You will require either a new permit or a permit variation if your activities move from prospecting into pre-production or full commercial development.

If your permit is limited to the management of waste from prospecting, you will need to vary it if you move beyond prospecting as the legislative requirements at the prospecting stages are less than those that apply at the extraction stage. In this context, the term ‘prospecting’ is unlikely to cover all the activities which are considered under other regulatory regimes and in industry to be part of exploration activities. You may want to consider applying for a mining waste permit that goes beyond the prospecting stage, which could then cover the entire exploration stage and beyond into commercial exploitation. Such permits would need to satisfy the full legislative requirements at the outset. This would give you the maximum flexibility in the way you conduct your operations and minimise any uncertainty over the scope of prospecting.

Under the Mining Waste Directive, where the derogation applies to the deposit of extractive waste, the requirements that apply to the management of all the extractive waste need to be considered separately to the requirements just for the deposit. For the deposit of non-hazardous waste under the derogation, the general requirements of article 4 of the Mining Waste Directive must be met. The measures to be taken should be based on BAT and detailed in either the Waste Management Plan or in separate documentation submitted with your application. If we’re not satisfied article 4 objectives will be met, we cannot apply the derogation.

[Read our position statement on the definition of extractive waste](http://www.environment-agency.gov.uk/research/library/position/34157.aspx#Mining_wastes) (www.environment-agency.gov.uk/research/library/position/34157.aspx#Mining_wastes) to learn about our interpretation of extractive waste and the principles we will apply in assessing which specific

materials arising during an extraction process are extractive waste. For oil and gas exploration, which is referred to as prospecting under the Mining Waste Directive, we expect this to include:

- spent drilling muds
- drill cuttings
- flowback fluid mixed with produced water
- proppants like sand removed from flowback fluid
- waste gas, including any fugitive or transient emissions
- any condensates or contaminated residues that are discarded
- the proportion of the well stimulation fluid that does not return to the surface on completion of the operation

If the well stimulation fluid that doesn't return to the surface is mixed or modified in some way before it no longer serves a useful purpose, the mixed or modified fluid is classed as waste. The geology may preclude any mixing of the fluid with the strata underground, but in both cases you should include an assessment with each application for a permit.

The Waste Management Plan and the environmental permit

If you are managing extractive waste you are required to produce and implement a Waste Management Plan. You should consider the management of such wastes as early as possible in the design of the well site. Our granting of a permit or a permit variation signifies our approval of the Waste Management Plan, which may be subject to conditions in the permit.

The starting point for any Waste Management Plan is to describe the environmental risks posed by your proposals in the form of an environmental risk assessment. This must follow the [methodology set out in our horizontal guidance H1 Environmental Risk Assessment](http://www.environment-agency.gov.uk/business/topics/permitting/36414.aspx) (www.environment-agency.gov.uk/business/topics/permitting/36414.aspx), but can use information prepared for a risk assessment required at the planning application stage.

The objectives of the Waste Management Plan must be to:

- prevent or reduce the production of extractive waste, and its harmfulness
- encourage recovery of waste where possible
- ensure safe short- and long-term disposal

Any permit we issue will contain a condition requiring the techniques described in the Waste Management Plan to be followed. We will also limit permitted operations to activities that are thoroughly covered in the Plan. If an activity isn't covered satisfactorily we may not be able to permit it.

We expect a single Waste Management Plan to cover all the requirements for all the activities that will, or could, generate extractive waste at a defined location. If you apply for a permit that isn't limited to prospecting, your Waste Management Plan can be limited to operations undertaken at that stage or at any part of it. If you then decide to proceed to another phase, a revised Waste Management Plan can be submitted for approval.

Information required in the Waste Management Plan

There must be enough information in the Waste Management Plan to allow us to evaluate your ability to meet its objectives and your obligations under the Mining Waste Directive. Our remit is to ensure:

- you take all measures necessary to prevent, or reduce as far as possible, any adverse effects on the environment and human health brought about by the management of extractive waste
- the requirements of article 5 of the Mining Waste Directive are met

The measures taken must be based on BAT. It's important that the Waste Management Plan is phrased in clear and certain terms so that we can be satisfied it does contain such measures.

Some of the requirements of a Waste Management Plan may be met by the information in plans provided for other regulatory regimes such as for HSE or DECC. You can rely on this information, but so that we can be satisfied it's adequate, it normally needs to be included as part of your permit application. For example, we'll need to assess whether the proposed well construction and any measures in relation to seismic activity provide sufficient protection to groundwater. Such information can normally be submitted either directly or in a reference to a substantive, valid and up-to-date document.

During pre-application discussions, you should agree with us the detail of the specific requirements, such as whether a groundwater activity will be part of the mining waste operation or whether air dispersion modelling is required. The information required for all Waste Management Plans, regardless of site-specific circumstances, can be summarised as follows.

The Plan should state:

- the characteristics of each waste as laid down by Annex II of the Mining Waste Directive
- the estimated total quantities of extractive waste to be produced when the activity is carried out

The wastes should be characterised accurately as inert, non-hazardous non-inert, or hazardous. As the characterisation of certain waste types (for example, drilling muds and flowback fluids) will be based on predictions, we expect the Plan to include a waste monitoring programme. The Plan also needs to explain how the choice of design of the operation will reduce, as far as reasonably possible, the quantity of waste produced and its harmfulness.

The operations generating these wastes should also be stated, including whether they are exploratory only. Any subsequent treatment of each waste should be indicated.

The Plan should describe:

- how the environment and human health could be adversely affected by the management of the wastes
- the preventive measures to be taken to minimise environmental impact during operation and after closure

Details of a contingency plan setting out the steps to be taken if the waste produced isn't as predicted should be included. There should also be information demonstrating that all necessary measures will be taken to prevent or reduce as far as possible any adverse effects on the environment and human health in relation to the deposit of waste.

The proposed plan for closure should be outlined.

Finally the Plan should state the measures proposed to prevent:

- deterioration of water status in accordance with the Water Framework Directive (see [Guidance on the protection of groundwater and the Waste Management Plan](#))
- air and soil pollution (see [Guidance of the management of gas and the Waste Management Plan](#))

[See our environmental permitting guidance for mining waste operations](#) (www.environment-agency.gov.uk/business/sectors/116582.aspx) for details of applicable standards and protection measures.

It seems unlikely that flowback fluid and produced waters will be reused at the exploration stage. We will need to assess any proposal to reuse this fluid to ensure:

- it performs the same function as fresh injection fluid
- poses no additional risks to people and the environment

However, there is no absolute ban in the Mining Waste Directive on the reuse of such fluid.

Guidance on the protection of groundwater and the Waste Management Plan

A groundwater activity permit will usually be required to prevent the pollution of groundwater. The required information (see [Environmental permit for a groundwater activity](#)) should be included as an annex to the Waste Management Plan.

The assessment of risk to groundwater made at pre-application stage will identify the measures required to protect groundwater as part of the information on borehole construction and testing and the composition of the well stimulation fluid. All this information, plus details of the measures to be taken during decommissioning of the borehole, need to be included in the Waste Management Plan.

Guidance on the management of waste gas and the Waste Management Plan

Flaring

You should apply the hierarchy of controls to ensure waste gas is prevented, minimised and rendered harmless. However, we recognise that some waste gas may be generated during exploratory oil and gas operations. To minimise the impact of this waste gas on the environment, our advice is to consider installing an engine to burn the gas and recover energy for use in the exploration activities or for export offsite. If it's not possible to recover the gas to a gas engine because, for example, the gas is unsuitable for combustion or the flow is too intermittent, you must make this clear in the Waste Management Plan and consider the best environmental option for disposal of the waste gas.

An enclosed flare is our preferred means of waste gas disposal and is considered BAT. However we will consider other options to ensure that waste gas is oxidised.

Where a flare is installed it must be designed, maintained and operated to an appropriate standard. For example, we would expect the site to be manned during the flaring operation. The Waste Management Plan should include sufficient information for us to understand how the proposed design was chosen and to assess whether it provides sufficient protection for the environment without endangering human health. The Plan should include at least the following information on the proposed flare design and operation:

- the likely flow rates of gas at the various stages of the exploratory well development
- the operational flow range for the flare and the turndown ratio, which is a function of the flare design rather than the flow from the well
- what plans are in place should the flow rate of the gas exceed or fall below the flare's flow range
- the expected composition of the gas and proposals for ensuring complete combustion of contaminants
- details of how the gas is to be extracted from the well, for example, by flow due to pressure within the well or by forced draught

- justification of the proposed flare design, for example, enclosed or semi-enclosed, and details of the expected combustion performance
- assessments of potential noise, light and vibration, bearing in mind that flares may not be suitable in some locations because of potential impacts on the local community
- a description of how the flare system will be maintained, including its associated pipework, so to ensure reliability and prevent leaks
- an assessment of whether the borehole would pressurise up when not being actively flared or vented, and the consequent risk of gas finding alternate pathways
- flame monitoring proposals including the ability to monitor flow continuously, main flame detection and auto-ignition as well as telemetry to alarm if the flare goes out
- details of safety valves or points where there may be fugitive releases and provision for pressure relief valves, including the pressure at which they blow and what happens when they do
- a monitoring protocol, which should include monitoring of the gas entering the flare and may include a requirement for monitoring of nitrogen oxides under certain site-specific circumstances, such as proximity to an Air Quality Management Area

Where flaring isn't a safe or practical option, the waste gas must be vented in a controlled manner which minimises the environmental impact of the emission. [Annex F Air emissions of our horizontal guidance](http://www.environment-agency.gov.uk/business/topics/permitting/36414.aspx) (www.environment-agency.gov.uk/business/topics/permitting/36414.aspx) can be used to assess the impact of a vented release. Where the impact is found to be significant, dispersion modelling should be carried out. The Waste Management Plan should include details of the vent, specifically its location, height, diameter and expected range of flow of waste gas.

Amendments to EPR 2010 set out in regulation 35 of the Environmental Permitting (England and Wales) (Amendment) Regulations 2013, which transpose the requirements of the Industrial Emissions Directive, mean that the incineration of hazardous waste in plant like a flare with a capacity >10 tonnes per day will require a permit. Where the flare has this capacity but will operate below it, this part of the site's operations can be covered by the mining waste permit using a condition that limits the capacity of the flare. Before this limit can be exceeded, you'll need to apply for an installation permit so as to meet the requirements of the Industrial Emissions Directive. A variation of the mining waste permit containing the condition limiting flare capacity will also need to be made. If you anticipate this will be the case, it's likely to save time if you apply for an installation permit at the outset.

Fugitive methane emissions

The Waste Management Plan should include information on the detection and prevention of fugitive emissions of methane. As a minimum this should include:

- a description of how leaks are to be prevented
- a monitoring protocol based on direct monitoring using optical gas imaging

Leak prevention should involve the maintenance of infrastructure like pipelines and a plan to inspect and deal with any accidental leaks. The aim should be 100% containment.

Environmental permit for a radioactive substances activity

You can access all our guidance for users of radioactive substances through our [our web page on radioactivity](http://www.environment-agency.gov.uk/radioactive) (www.environment-agency.gov.uk/radioactive).

Scope of Schedule 23 to EPR 2010

Water used in well stimulation activities is likely to pick up naturally occurring radioactive materials (NORM) as these are present in many geological formations including oil and gas bearing strata. Water that flows back to the surface following well stimulation may then include enough radioactivity to be classed as radioactive waste and so require an environmental permit for its temporary storage and subsequent disposal. This will also apply to any produced water generated with the oil and gas. Sands, sediments, scales and sludges in gas, oil or water process vessels may become contaminated and may also need to be covered by a permit.

The legislation used to control NORM wastes in England is schedule 23 to EPR 2010 as given in the Environmental Permitting (England and Wales) (Amendment) Regulations 2011, Statutory Instrument 2011 No. 2043. There are separate legislative requirements for occupational exposure to ionising radiation regulated by HSE. There are also controls on the transport of radioactive materials, which is regulated by the Office for Nuclear Regulation, another branch of HSE (advice can be obtained by emailing class7@hse.gsi.gov.uk).

Schedule 23 defines the production of oil and gas as a NORM industrial activity (NIA). Consequently the accumulation and disposal of radioactive wastes can only be carried out under an environmental permit. We consider well stimulation during the exploration phase – as well as the commercial production phase – to be production of oil and gas. Drilling and completing a well, prior to production of oil or gas, is not an NIA. The test of whether an NIA is occurring is that production of oil and gas is expected, even at test quantities, and that radioactive wastes are foreseen to arise. The first well stimulation will generally mark the commencement of an NIA.

Some concentrations of NORM are so low they are not subject to schedule 23 controls – see the table below for some examples – and so no permit is required. However, experience suggests that these very low concentrations are unlikely to be the case for oil and gas exploration operations. Should you wish to make the case that a material is outside the scope of schedule 23 controls, it is up to you to demonstrate that these threshold levels won't be exceeded. Where more than one of these radionuclides is present, schedule 23 contains a simple formula you can use to establish whether the mixture is in or out of its scope.

Concentrations of NORM below which activities are not subject to Schedule 23, EPR 2010 controls

Radionuclide	Solid (Bq*/g)	Liquid (Bq/l)	Gaseous (Bq/m ³)
Ra-226+	0.5	1	0.01
Pb-210+	5	0.1	0.01
Po-210	5	0.1	0.01
Ac-227+	1	0.1	0.001
Th-232sec	0.5	0.1	0.001
Th-232	5	10	0.001
Ra-228+	1	0.1	0.01

*Becquerel (Bq) is the SI unit of radioactivity.

Source: Table 1 of Schedule 23 to EPR 2010 (as amended in 2011)

Permit applications for radioactive imaging

The use of wireline well logging sources (that is, where a tool is lowered into the borehole and uses radioactivity to learn more about the properties of the rock strata) is regulated by an environmental permit issued to the company that owns and uses the radioactive sources. This is not usually the exploration or production operators, but a service company carrying out this work

for the oil and gas industry. Should you wish to carry out this function yourself, you'll need to obtain the necessary permit.

Any use of radioactive tracers to determine the extent of shale bed fracturing will require an application for a specific environmental permit for that work. We don't expect this to be a frequent requirement and therefore don't intend to provide specific guidance on this specialised use of radioactivity. If radioactive tracer investigations are foreseen, you should discuss this with us at the earliest possible opportunity. Permits of this type are unusual and will need special consideration.

Pre-application discussions and radiological assessments

We suggest you arrange to have early discussions about your intended application with the radioactive substances officer for the relevant part of the country. [Download our Radioactive Substances Regulation application form](http://www.environment-agency.gov.uk/business/sectors/117043.aspx) (www.environment-agency.gov.uk/business/sectors/117043.aspx) to find out how to do this.

Environmental permits concerned with radioactive waste require you to manage and operate your permitted activities having consulted a suitable radioactive waste advisor about how to comply with your permit. We suggest you consider securing that advice as soon as you begin to prepare your permit application. You should find out from your radioactive waste adviser whether they will carry out the radiological assessment to accompany the application or whether a specialist contractor will be required. [Visit SEPA's website for information from the UK's environment agencies about radioactive waste advisors](http://www.sepa.org.uk/radioactive_substances/radioactive_waste_advisors) (www.sepa.org.uk/radioactive_substances/radioactive_waste_advisors.aspx) and a list of RWAs.

[Visit our publications catalogue to download general guidance \(PDF, 596 KB\)](http://publications.environment-agency.gov.uk/dispay.php?name=GEHO1202BKLH-E-E.pdf) (http://publications.environment-agency.gov.uk/dispay.php?name=GEHO1202BKLH-E-E.pdf) on the requirements of the radiological assessment. The guidance sets out the principles for the assessment of the doses of ionising radiation to the public arising from planned discharges to the atmosphere and to the aquatic environment.

We'll use the results of assessments carried out following these principles and guidance to help us determine whether to authorise discharges of radioactive waste. Some aspects of the assessment may be specific to oil and gas exploration like the reuse of flowback fluids in subsequent well stimulation. These aspects will need to be agreed in advance with the regulatory officer dealing with the application.

Radioactive substances and the Waste Management Plan

Most of the conditions likely to feature in your permit are explained in our guidance on [how to comply with your environmental permit for radioactive substances \(PDF 274 KB\)](#), though there will be some permit conditions specific to oil and gas exploration. We have also published [guidance on how we regulate non-nuclear radioactive substances activities \(PDF 277 KB\)](#) under EPR 2010. If we include other or amended conditions in a permit, and you are unsure about compliance, you can seek additional guidance from the regulatory officer dealing with your permit.

In your application you'll need to identify the types of radioactive waste you foresee generating. This will generally be any flowback fluid or produced water requiring disposal or reuse, but should also include any scale or sediments that require management, removal and disposal. This information can be given in the Waste Management Plan.

In broad terms, radioactive substances environmental permit conditions are based on the following approach. As part of the Waste Management Plan, you should:

- outline how BAT will be used to minimise radioactive waste generation, radioactive waste disposals to the environment and the radiological impact of disposals

- set out how radioactive waste will be received, accumulated or disposed of, in the manner and amounts specified in your permit
- set out suitable management arrangements to comply with your permit, including sufficient competent persons and resources
- keep records demonstrating compliance and provide information to us as requested

Compliance with these conditions is likely to require fully contained flowback fluid transfer systems and bunded tank storage. We will not accept storage of flowback fluid or produced water in open surface lagoons. Losses and spills should be eliminated in all transfers onsite including transfers to road vehicles. Contingency plans and equipment will be required to minimise the spread and impact of any spills.

We consider the reuse of flowback fluid following treatment and blending with fresh water to be the preferred and sustainable option for its management as part of a wider Waste Management Plan that also covers final disposal. We expect reuse of flowback fluid to be an element of any Plan, but recognise that offsite disposal may be proposed at the exploration stage. We will consider any alternative waste management options in the Waste Management Plan on their merits.

Flowback fluid that contains sufficient NORM is radioactive waste from the point of discharge from the well. It remains radioactive waste until final discharge from the offsite effluent treatment works, or until the point of reuse as fracturing fluid. Disposal of flowback fluid simply by re-injecting it into the shale strata is not permissible under groundwater protection legislation and isn't considered further here. The re-injection of produced water may be possible and you should begin discussing any proposals for re-injection of produced water with us at the earliest opportunity.

Onsite storage of flowback fluid should be for as short a time as is reasonably practicable. We'd expect your Waste Management Plan to indicate a storage period of no more than three months under normal circumstances, including the long period after well stimulation using high volume hydraulic fracturing when flowback fluid volumes are relatively low. Similar conditions will be placed on produced water, scale and sediment wastes.

Environmental permit for a water discharge activity

You don't need a permit to discharge clean surface water run-off (for example from a roof, road, pathway or clean hardstanding area) to a watercourse. The run-off should be managed so as to ensure it stays clean and uncontaminated. An appropriate monitoring regime should be included.

If surface water run-off does become contaminated, you should inform us. You will then require an environmental permit for a water discharge activity. We'll only issue a permit if it isn't feasible to stop the contamination at source and the contamination will not pollute the receiving water. If we don't issue a permit we will require you to find alternatives to discharging the contaminated run-off such as removing it using tankers or treating it onsite.

More information on applying for an environmental permit for a water discharge activity is given in:

- part 5 of our [guidance on how to comply with an environmental permit](http://www.environment-agency.gov.uk/business/topics/permitting/32320.aspx) (www.environment-agency.gov.uk/business/topics/permitting/32320.aspx)
- our additional [guidance for water discharge and groundwater \(from point source\) activity permits](http://www.environment-agency.gov.uk/business/topics/water/121308.aspx) (www.environment-agency.gov.uk/business/topics/water/121308.aspx)
- [Annexes D and E of our H1 Horizontal Guidance](http://www.environment-agency.gov.uk/business/topics/permitting/36414.aspx) (www.environment-agency.gov.uk/business/topics/permitting/36414.aspx)

If you want to discharge to a public foul sewer (or a drain that connects to one), you don't need an environmental permit from us but should contact your sewerage undertaker. This is usually the local water company. You can [find details of water companies on the Ofwat website](#).

Water supplies

We strongly advise you to investigate water availability early on in the planning process.

Mains water supplies

If your water is supplied through a utility company, it's their responsibility to ensure the extra demand for water created by your activities fits within the conditions of their water resources plans and abstraction licence(s). You should be aware that there may not be sufficient water available to meet high extra demand in some parts of the country.

Abstraction from groundwater and surface water

The abstraction of water from rivers, streams, lakes and groundwater is controlled under the Water Resources Act 1991. If you're proposing to abstract more than 20 m³ per day of water directly from a water source you'll need to apply to us for an abstraction licence. Abstractions not exceeding 20 m³ per day are exempt from the need for a licence. This threshold applies to a whole operation or a continuous series of operations and not, for example, to each abstraction point from the same water source. Abstractions for de-watering to prevent interference with mineral working and engineering works are also exempt from the need for a licence, although we anticipate this exemption will be removed in 2014.

As part of the abstraction licensing process, we will need to consider:

- what sources of water are being proposed
- the potential impacts on water levels, wetlands, river flows, the aquatic environment and other water users

The first opportunity to consider this will be at the pre-planning or planning application stages. During the latter, planners are able to request:

- details of the sources of water to be abstracted, the feasibility of doing so and the suitability of the source
- information on the quantities of water to be used and the purpose for which they will be used
- an assessment of the potential effects on the environment and other water users, including other abstractors
- hydrological and hydrogeological information

If not requested at the planning stage then we'll almost certainly need this information later on. Our [Catchment Abstraction Management Strategies](http://www.environment-agency.gov.uk/business/topics/water/119927.aspx) (www.environment-agency.gov.uk/business/topics/water/119927.aspx) detail our assessment of water availability surface and groundwater on a catchment scale.

We'll advise you if you need to provide any further information to support your application for a licence.

Read more about the abstraction licence application process in our guidance, [Abstracting water: a guide to getting your licence](http://www.environment-agency.gov.uk/business/topics/water/32020.aspx) (www.environment-agency.gov.uk/business/topics/water/32020.aspx).

For groundwater abstraction proposals, there is an additional process to go through. Under section 32 of the Water Resources Act 1991, you are required to obtain a groundwater investigation consent to construct and test pump a borehole before an abstraction licence application can be made. This requirement doesn't apply to abstractions that are exempt from the need for a licence.

Flood defence consent

If you want to carry out works in, over, under or near a main river or a flood defence (including a sea defence), you'll need to apply to us for consent to ensure your activities do not:

- cause or make existing flood risk worse
- interfere with our work
- adversely affect the local environment, fisheries or wildlife

A main river is a watercourse that is shown on a main river map and includes any structure or appliance for controlling or regulating the flow of water into or out of the channel.

We only issue consents for watercourses that are classed as main rivers. To carry out work on other watercourses, you will need to apply for a consent to the authority responsible for a particular watercourse. The responsible authority will be either an internal drainage board or lead local flood authority.

[Read more our in our guidance on applying for a flood defence consent](http://www.environment-agency.gov.uk/business/topics/143729.aspx) (www.environment-agency.gov.uk/business/topics/143729.aspx).

Response to seismic activity and potential well deformation

DECC is responsible for ensuring that operators put in place measures to reduce the risk of seismic events occurring that are larger than the normal micro-seismicity expected as a result of well stimulation using high volume hydraulic fracturing. [Visit DECC's shale gas web page for more information](http://www.gov.uk/oil-and-gas-onshore-exploration-and-production#resumption-of-shale-gas-exploration) (www.gov.uk/oil-and-gas-onshore-exploration-and-production#resumption-of-shale-gas-exploration).

Just as for any other environmental risks associated with high volume hydraulic fracturing, operators will be required to provide:

- an assessment of the risks
- the safeguards to reduce those risks
- the relevant monitoring required

You'll need to submit your assessment to DECC. We are responsible for any environmental impacts that occur as a result of such induced seismicity.

Monitoring

Producing a site condition report at the beginning and end of operations

A site condition report describes and records the condition of the land and groundwater at a site. This report enables you to demonstrate that:

- you have protected land and groundwater during the lifetime of the site
- the site is in a satisfactory state when you come to surrender your permit

You can do this by:

- submitting the application section of the site condition report, which describes the condition of the land and groundwater at the point at which an application for an environmental permit is made
- updating the site condition report during the lifetime of the permit
- completing the surrender sections of the site condition report and submitting the full report when applying to surrender an environmental permit

The site condition report provides a point of reference at the start of operations or at the time the permit is issued so that, when you want to surrender your permit, you can:

- decide whether there has been any contamination of the site
- ensure the land and groundwater are in a satisfactory state when you apply to surrender the permit

The report also describes what condition the land and groundwater are in at the time of surrender. If the land and groundwater aren't in a satisfactory state we will not accept your application to surrender your environmental permit.

Read more in our guidance on site condition reports and the surrender process found in:

- [Regulatory Guidance Note No. 9 Surrender](http://www.environment-agency.gov.uk/business/topics/permitting/36419.aspx) (www.environment-agency.gov.uk/business/topics/permitting/36419.aspx)
- [H5 Site condition report guidance](http://www.environment-agency.gov.uk/business/topics/permitting/36414.aspx) (www.environment-agency.gov.uk/business/topics/permitting/36414.aspx)

Operational monitoring

Waste management

You will need to carry out monitoring to demonstrate you're complying with your site's permit conditions. The monitoring regime will be set out in the permit or accompanying Waste Management Plan. Examples of the types of monitoring that may be required include:

- monitoring and recording the quantity of flowback fluid produced each day along with the quantities despatched offsite for disposal
- monitoring and recording the quantity of waste gas destroyed by flaring, together with the temperature of the flare at the base and tip of the flame
- optical gas imaging of site infrastructure with the aim of ensuring 100% containment of methane

Each consignment of waste flowback fluid must be sampled before despatch offsite for disposal and a reference sample retained for further independent analysis. It may be possible to reduce the frequency of sampling if the results obtained are consistently within expected ranges and when the volume of waste generated declines at the end of the extended well testing period.

There are only a small number of laboratories able to carry out the measurements for low concentrations of radium-226 and radium-228 likely to be required for monitoring radioactive substances. Details of these laboratories can be obtained from Oil & Gas UK.

Groundwater

We already monitor groundwater quality at around 3,000 sites across England. Where a new infrastructure development presents a significant risk to groundwater we may also require a programme of groundwater monitoring to be designed, agreed, installed and performed to give

early warning of developing groundwater pollution or interference to groundwater flow. This programme may include offsite locations if necessary to identify pollution and to allow monitoring should the site become inaccessible.

[Read more about groundwater monitoring in Chapters 7 and 8 of GP3](http://www.environment-agency.gov.uk/research/library/publications/144346.aspx) (www.environment-agency.gov.uk/research/library/publications/144346.aspx).

Water abstraction

If you have a licence to abstract surface water or groundwater, the conditions of your licence will require any water abstracted to be metered. You'll also be required to send us information about how much water has been abstracted.

Monitoring post-operations and during mothballing

Once a site's permit has been surrendered, no further monitoring by you is required as you'll have already demonstrated, through your site condition report, that the site has been returned to a satisfactory state.

If operations have ceased temporarily but the site's permit hasn't been surrendered, you will be required to continue management control of the site at a level proportionate to the risks it presents. For example, if the well is sealed and no gas or water is flowing, the ongoing controls and monitoring requirements could be minimal. We would want to ensure that any temporary plugging has been done satisfactorily and would liaise with HSE to ensure its guidelines had been followed.

A permit variation should be sought for mothballed wells where you do not intend to surrender the permit.

List of abbreviations

BAT	Best Available Techniques
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
EIA	Environmental Impact Assessment
EPR	Environmental Permitting Regulations
HSE	Health and Safety Executive
NIA	NORM Industrial Activity
NORM	naturally occurring radioactive material
SPZ	Source Protection Zone

Glossary

Flowback fluids

Fluid contaminated with minerals and NORM returned to the surface during and following well stimulation

High volume hydraulic fracturing

The injection of 1,000 m³ of fluid or more at a pressure high enough to fracture a rock formation and release the methane contained within it

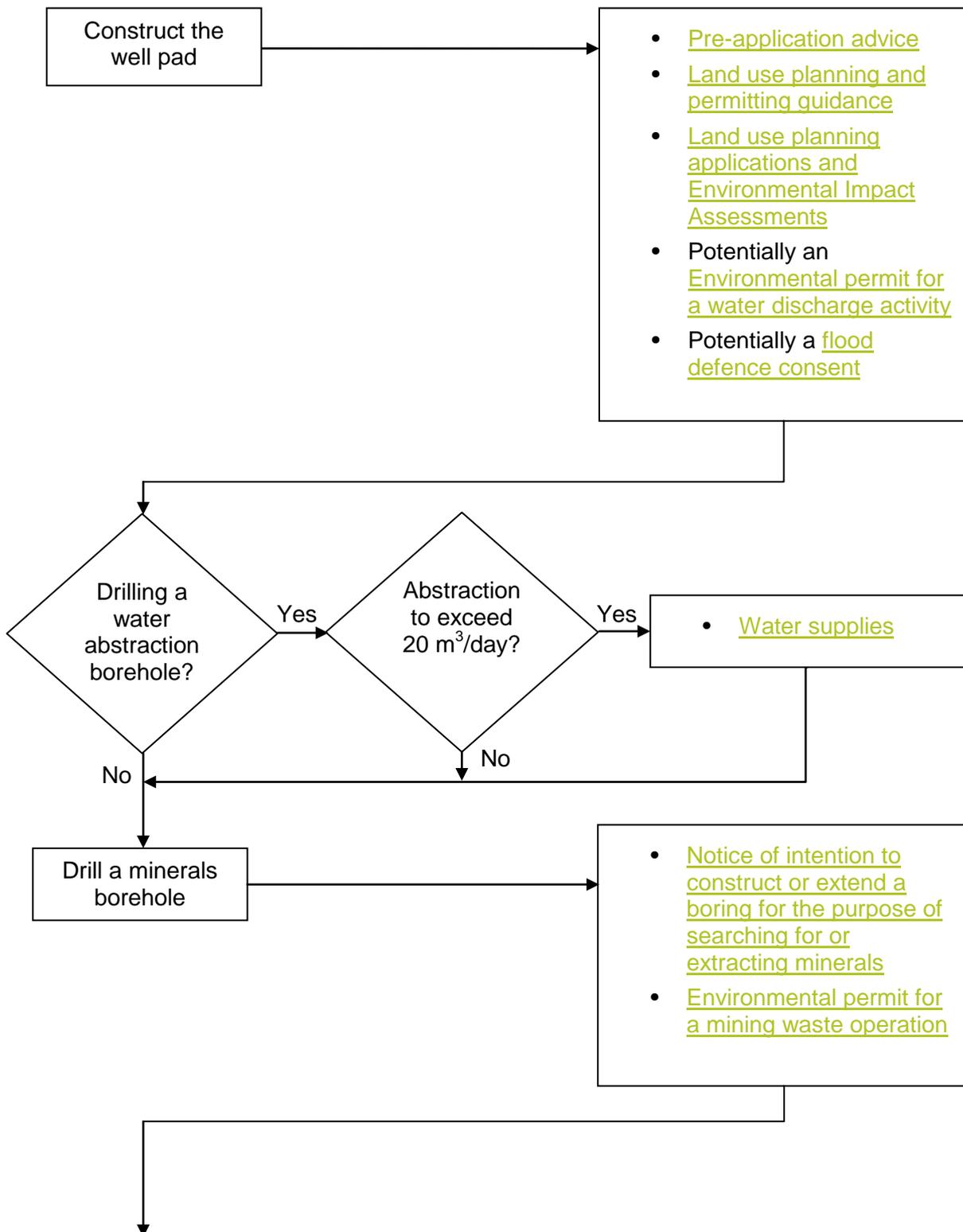
Produced water

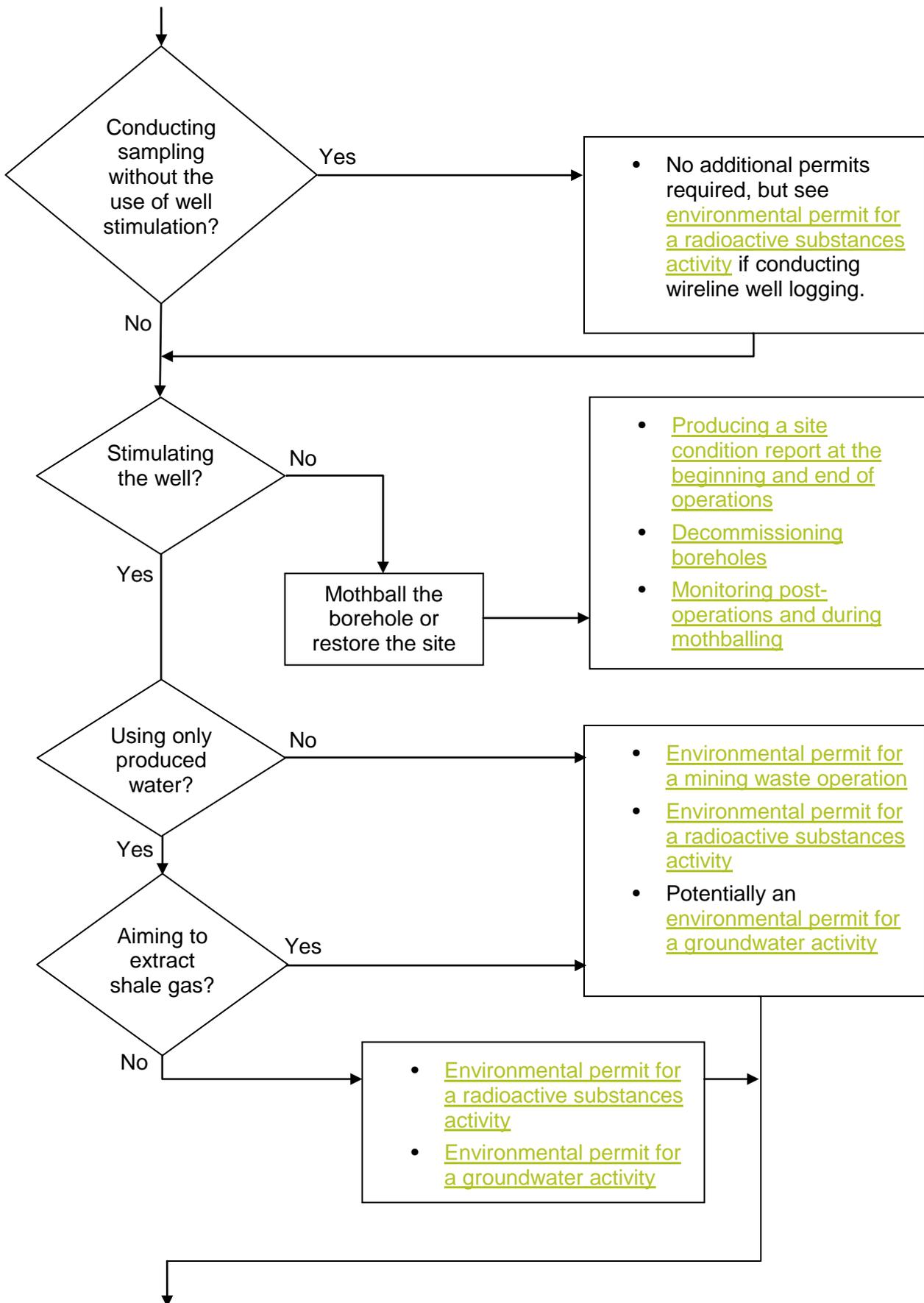
The water naturally present in some hydrocarbon-bearing strata that is brought up during the extraction of oil and gas

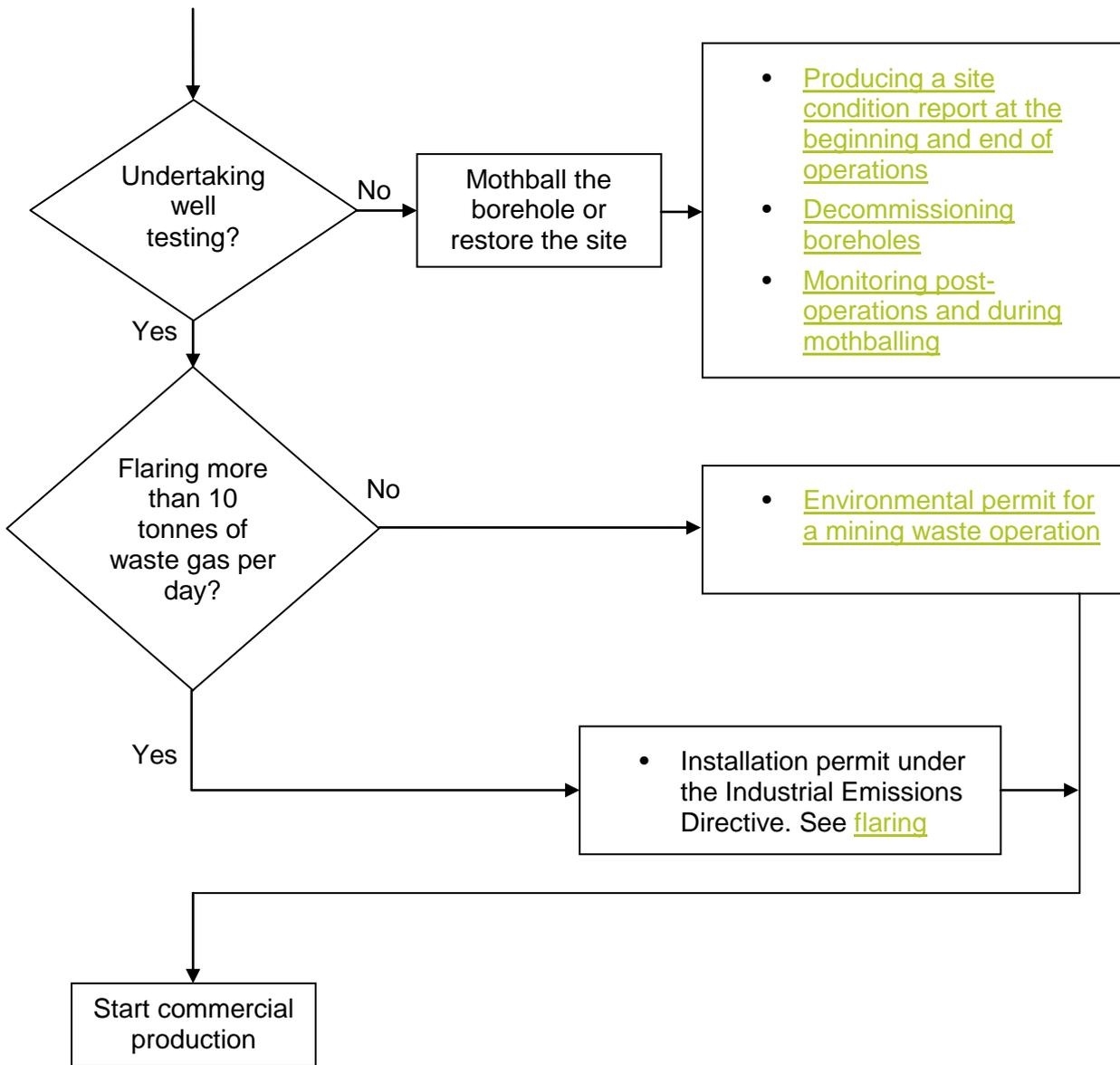
Well stimulation fluids

Fluids, often water, mixed with additives used to encourage more oil and gas to flow from a particular rock formation

Appendix: Flow diagram showing the sections of the guidance applicable to different stages of oil and gas exploration







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