

Permit with introductory note

The Environmental Permitting (England & Wales) Regulations 2010

Cuadrilla Bowland Limited

Preston New Road Exploration Site
Preston New Road
Plumpton
Fylde
Lancashire
PR4 3PJ

Permit number
EPR/AB3101MW

Preston New Road Exploration Site

Permit numbers EPR/AB3101MW

Introductory note

This introductory note does not form a part of the permit

The main features of the permit are as follows.

This permit is for activities that relate to the exploration for hydrocarbon resources, namely:

1. A mining waste operation for the management of extractive waste not involving a Mining Waste Facility.
2. In respect of hydraulically fractured wells, a non-hazardous Mining Waste Facility for the accumulation of injected hydraulic fracturing fluid which will remain in the underground target formation and has become waste;
3. An above ground hazardous Mining Waste Facility for the temporary deposit and accumulation of hazardous waste in storage containers as the wells are successively drilled. The hazardous waste will include drill cuttings coated with residual Low Toxicity Oil Based Muds ("LTOBM").
4. A groundwater activity for the discharge, namely of fracturing fluid into the target formation, that might lead to an indirect input of a pollutant to groundwater.
5. The incineration by flaring of hazardous waste, namely natural gas above 10 tonnes per day, as an activity listed in schedule 1 of the Environmental Permitting (England and Wales) Regulations 2010.

At the Preston New Road Exploration Site, Plumpton, Fylde, Lancashire, PR4 3PJ

The status log of the permit sets out the permitting history, including any changes to the permit reference number.

Status log of the permit		
Description	Date	Comments
Application EPR/AB3101MW/A001	Duly made 06/06/2014	Application for an environmental permit.
Schedule 5 response	18/07/2014	Applicant response to Schedule 5 questions
Additional information received	14/08/2014	Updated information to support Financial Provision assessment and additional information to support groundwater and waste management determination
Additional information received	18/08/2014	Information on friction reducer
Additional information received	22/08/2014	Surface water and groundwater monitoring points
Additional information received	28/08/2014	Updated Waste Management Plan v2 and Appendix D
Additional information received	26/08/2014	Information on friction reducer
Additional information received	28/08/2014	Information on friction reducer
Additional information received	29/08/2014	Information on friction reducer
Additional information received	08/09/2014	Updated Waste Management Plan
Additional information received	19/09/2014	Noise Levels related to Uniflare 'UF10' Stacks
Additional information received	19/09/2014	Updated information to support Financial Provision
Additional information received	22/09/2014	Updated Waste Management Plan
Additional information received	24/09/2014	Response to questions on flow back fluid
Additional information received	29/09/2014	Response to questions on noise
Additional information received	10/10/2014	Response to questions on Waste Management Plan
Additional information received	10/10/2014	Updated Waste Management Plan
Additional information received	10/10/2014	Revised Site Plan
Additional information received	10/10/2014	Well Design and Well Barrier Systems
Additional information received	20/10/2014	Response to questions on flaring and venting
Additional information received	22/10/2014	Updated Waste Management Plan
Additional information received	05/11/2014	Updated Waste Management Plan
Permit determined	16/01/2015	Permit issued to Cuadrilla Bowland Limited

End of introductory note

Permit

The Environmental Permitting (England and Wales) Regulations 2010

Permit number
EPR/AB3101MW

The Environment Agency hereby authorises, under regulation 13 of the Environmental Permitting (England and Wales) Regulations 2010

Cuadrilla Bowland Limited (“the operator”),
whose registered office is

Cuadrilla House
Stowe Court
Stowe Street
Lichfield
Staffordshire
WS13 6AQ

company registration number **08340918**

to operate an installation, to carry on a mining waste operation and to carry on a groundwater activity at

Preston New Road Exploration Site
Preston New Road
Plumpton
Fylde
Lancashire
PR4 3PJ

to the extent authorised by and subject to the conditions of this permit.

Name	Date
Principal Permitting Team Leader National Permitting Service	16/01/2015

Authorised on behalf of the Environment Agency

Conditions

1 Management

1.1 General management

- 1.1.1 The operator shall manage and operate the activities:
- (a) in accordance with a written management system that identifies and minimises risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformances, closure and those drawn to the attention of the operator as a result of complaints; and
 - (b) using sufficient competent persons and resources.
- 1.1.2 Records demonstrating compliance with condition 1.1.1 shall be maintained.
- 1.1.3 Any person having duties that are or may be affected by the matters set out in this permit shall have convenient access to a copy of it kept at or near the place where those duties are carried out.
- 1.1.4 The operator shall not start the closure of the mining waste facilities unless agreed in writing by the Environment Agency.
- 1.1.5 The financial provision for meeting the obligations under this permit set out in the Deed of Trust dated 16/01/2015 made between the operator and the Environment Agency shall be maintained by the operator whilst there is a waste facility involving the accumulation or deposit of hazardous waste and the operator shall produce evidence of such provision whenever required by the Environment Agency.

2 Operations

2.1 Permitted activities

- 2.1.1 The operator is only authorised to carry out the activities specified in schedule 1 table S1.1 (the "activities").

2.2 The site

- 2.2.1 The incineration of hazardous waste (activity A1) the management of extractive waste from exploratory activities, not involving a waste facility (activity A2), and the management of extractive waste by way of a waste facility for hazardous waste (activity A3) shall not extend beyond the site, being the land shown edged in green on the site plan at schedule 7 to this permit.
- 2.2.2 The management of extractive waste by way of a waste facility for non-hazardous waste (activity A4) shall only be carried out within the Upper and Lower Bowland Shale and Hodder Mudstone Formation and shall not extend beyond the area edged in red on the site plan at schedule 7 of this permit
- 2.2.3. The groundwater activity A5 shall be not extend beyond the area edged in red on the site plan at schedule 7 of this permit and shall only be carried out within the Upper and Lower

Bowland Shale and Hodder Mudstone Formation. The discharges shall be made at points along the laterals to be drilled in a westerly direction from the vertical boreholes and for a distance not exceeding 2000 metres as listed in table S3.2 (discharge points).

2.3 Operating techniques

- 2.3.1 (a) The activities shall, subject to the conditions of this permit, be operated using the techniques and in the manner described in the documentation specified in schedule 1, table S1.2, unless otherwise agreed in writing by the Environment Agency.
- (b) If notified by the Environment Agency that the activities are giving rise to pollution, the operator shall submit to the Environment Agency for approval within the period specified, a revision of any plan or other documentation ("plan") specified in schedule 1, table S1.2 or otherwise required under this permit which identifies and minimises the risks of pollution relevant to that plan, and shall implement the approved revised plan in place of the original from the date of approval, unless otherwise agreed in writing by the Environment Agency.
- 2.3.2 The operator shall review the waste management plan every five years from the date of initial approval and submit this to the Environment Agency for approval.
- 2.3.3 The injection borehole system shall be constructed to comply with the following:
- (a) the injection boreholes shall comply with the details submitted and agreed in the notice given by the operator to the Environment Agency under section 199 of the Water Resources Act 1991;
- (b) the outlets from the injection boreholes, shall be within the target strata specified in Table S1.1 at all times;
- (c) no part of the injection borehole at the well sites shall be situated within 10 metres of any watercourse (including any ditch that runs dry for part of the year), or any other surface water; or within 200 metres of a European site or Site of Special Scientific Interest (excluding one designated for geological purposes only) or within 200 metres of any other sensitive receptor.
- (d) no part of the injection boreholes at the well sites shall be situated within a SPZ1 or 50 metres of a well or borehole used for drinking water or other human consumption, other than where abstraction from that well or borehole is for the sole purpose of supplying water to the activity specified in table S1.1

2.4 Pre-operational conditions

- 2.4.1 The activities shall not be brought into operation until the measures specified in PO1 and PO4 in schedule 1 table S1.3 have been completed.
- 2.4.2. There shall be no incineration of hazardous extractive waste until the measures specified in PO2 and PO9 of schedule 1 table S 1.3 have been completed.
- 2.4.3 The injection boreholes shall not be drilled until the measures specified in PO8 of schedule 1 table S1.3 have been completed.
- 2.4.4 The groundwater activity A5 shall not be carried on until the measures specified in PO3, PO5, PO6 and PO7 of schedule 1 table S 1.3 have been completed.

3 Emissions and monitoring

3.1 Emissions to water, air or land

- 3.1.1 There shall be no point source emissions to water, air or land except from the sources and emission points listed in schedule 3 tables S3.1 S3.2 and S3.3.
- 3.1.2 The limits given in schedule 3 shall not be exceeded.
- 3.1.3 Subject to any other condition of this permit, periodic monitoring shall be carried out at least once every 5 years for groundwater and 10 years for soil, unless such monitoring is based on a systematic appraisal of the risk of contamination.

3.2 Emissions of substances not controlled by emission limits

- 3.2.1 Emissions of substances not controlled by emission limits (excluding odour) shall not cause pollution. The operator shall not be taken to have breached this condition if appropriate measures, including, but not limited to, those specified in any approved emissions management plan, have been taken to prevent or where that is not practicable, to minimise, those emissions.
- 3.2.2 The operator shall:
- (a) if notified by the Environment Agency that the activities are giving rise to pollution, submit to the Environment Agency for approval within the period specified, an emissions management plan which identifies and minimises the risks of pollution from emissions of substances not controlled by emission limits;
 - (b) implement the approved emissions management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.
- 3.2.3 All liquids in containers, whose emission to water or land could cause pollution, shall be provided with secondary containment, unless the operator has used other appropriate measures to prevent or where that is not practicable, to minimise, leakage and spillage from the primary container.
- 3.2.4 The operator shall take appropriate measures:
- (a) to prevent the input of hazardous substances to groundwater; and
 - (b) where a non-hazardous pollutant is not controlled by an emission limit, to limit the input of such non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater.

3.3 Odour

- 3.3.1 Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved odour management plan, to prevent or where that is not practicable to minimise the odour.
- 3.3.2 The operator shall:
- (a) if notified by the Environment Agency that the activities are giving rise to pollution outside the site due to odour, submit to the Environment Agency for approval within the period specified, an odour management plan which identifies and minimises the risks of pollution from odour;

- (b) implement the approved odour management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.

3.4 Noise and vibration

3.4.1 Emissions from the activities shall be free from noise and vibration at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved noise and vibration management plan to prevent or where that is not practicable to minimise the noise and vibration.

3.4.2 The operator shall:

- (a) if notified by the Environment Agency that the activities are giving rise to pollution outside the site due to noise and vibration, submit to the Environment Agency for approval within the period specified, a noise and vibration management plan which identifies and minimises the risks of pollution from noise and vibration;
- (b) implement the approved noise and vibration management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.

3.5 Monitoring

3.5.1 The operator shall, unless otherwise agreed in writing by the Environment Agency, undertake the monitoring specified in the following tables in schedule 3 to this permit:

- (a) point source emissions specified in tables S3.1 and S3.2;
- (b) surface water or groundwater monitoring specified in table S3.5;
- (c) process monitoring specified in S3.6;
- (d) ambient air specified in S3.7

3.5.2 The operator shall maintain records of all monitoring required by this permit including records of the taking and analysis of samples, instrument measurements (periodic and continual), calibrations, examinations, tests and surveys and any assessment or evaluation made on the basis of such data.

3.5.3 The operator shall carry out:

- (a) regular calibration, at an appropriate frequency, of systems and equipment provided for carrying out any monitoring and measurements necessary to determine compliance with these rules; and
- (b) regular checking, at an appropriate frequency, that such systems and equipment are serviceable and correctly used

3.5.4 Monitoring equipment, techniques, personnel and organisations employed for the emissions monitoring programme and the environmental or other monitoring specified in condition 3.5.1 shall have either MCERTS certification or MCERTS accreditation (as appropriate), where available, unless otherwise agreed in writing by the Environment Agency.

3.5.5 If required by the Environment Agency, the operator shall

- (a) take such samples and conduct such measurements, tests, surveys, analyses and calculations, including environmental measurements and assessments, at such times and using such methods and equipment as the Environment Agency may reasonably specify and

- (b) keep samples, provide samples, or dispatch samples for tests at a laboratory, as the Environment Agency reasonably specifies, and ensure that the samples or residues thereof are collected from the laboratory within three months of receiving written confirmation that testing and repackaging in accordance with the relevant legislation are complete.
- 3.5.6 Permanent means of access shall be provided to enable sampling/monitoring to be carried out in relation to the emission points specified in schedule 3 tables S3.1, S3.2, S3.4, S3.5, S3.6 and S3.7, unless otherwise agreed in writing by the Environment Agency.
- 3.5.7 The operator shall, prior to, or on commencement of flaring, and monthly thereafter; analyse the flare feed gas. The analysis shall include speciation and concentration of organic substances, carbon monoxide, sulphur containing compounds, halogen containing compounds and moisture. A report of this analysis shall be submitted to the Environment Agency within 28 days of completion of each analysis.
- 3.5.8 The operator shall by calculation determine the emissions of the substances identified in table S3.1, based on the most recent feed gas composition analysis, feed gas flow rate and combustion efficiency of the flare.
- 3.5.9 The groundwater monitoring plan and Environmental Management and Monitoring Plan specified in Table S1.2, Schedule 1 shall be implemented unless otherwise agreed in writing.

The plans shall be reviewed within 6 months of start of operations and a written report submitted to the Environment Agency for approval detailing the review and containing any proposals for amending the plans.

Any revised ground water monitoring plan or revised environmental management and monitoring plan should be implemented in place of the original in accordance with the Environment Agency's written approval unless otherwise agreed in writing

4 Information

4.1 Records

- 4.1.1 All records required to be made by this permit shall:
 - (a) be legible;
 - (b) be made as soon as reasonably practicable;
 - (c) if amended, be amended in such a way that the original and any subsequent amendments remain legible, or are capable of retrieval; and
 - (d) be retained, unless otherwise agreed in writing by the Environment Agency, for at least 6 years from the date when the records were made, or in the case of the following records until permit surrender:
 - (i) off-site environmental effects; and
 - (ii) matters which affect the condition of the land and groundwater.
- 4.1.2 The operator shall keep on site all records, plans and the management system required to be maintained by this permit, unless otherwise agreed in writing by the Environment Agency.

4.2 Reporting

- 4.2.1 The operator shall send all reports and notifications required by the permit to the Environment Agency using the contact details supplied in writing by the Environment Agency.
- 4.2.2 Within 28 days of the end of the reporting period the operator shall, unless otherwise agreed in writing by the Environment Agency, submit reports of the monitoring and assessment carried out in accordance with the conditions of this permit, as follows:
- (a) in respect of the parameters and emission points specified in schedule 4 table S4.1;
 - (b) for the reporting periods specified in schedule 4 table S4.1 and using the forms specified in schedule 4 table S4.2 ; and
 - (c) giving the information from such results and assessments as may be required by the forms specified in those tables.
- 4.2.3 For activities A3 and A4, a report describing the behaviour of the mining waste facility over the previous year shall be submitted to the Environment Agency by 31 January (or other date agreed in writing by the Environment Agency) each year. The report shall include a review of the results of the monitoring and assessment carried out in accordance with the conditions of this permit including an interpretive review of that data.

4.3 Notifications

- 4.3.1 (a) In the event that the operation of the activities gives rise to an incident or accident which significantly affects or may significantly affect the environment, the operator must immediately—
- (i) inform the Environment Agency,
 - (ii) take the measures necessary to limit the environmental consequences of such an incident or accident, and
 - (iii) take the measures necessary to prevent further possible incidents or accidents;
- (b) in the event of a breach of any permit condition the operator must immediately—
- (i) inform the Environment Agency, and
 - (ii) take the measures necessary to ensure that compliance is restored within the shortest possible time;
- (c) in the event of a breach of permit condition which poses an immediate danger to human health or threatens to cause an immediate significant adverse effect on the environment, the operator must immediately suspend the operation of the activities or the relevant part of it until compliance with the permit conditions has been restored.
- 4.3.2 Any information provided under condition 4.3.1 (a)(i), or 4.3.1 (b)(i) where the information relates to the breach of a limit specified in the permit, shall be confirmed by sending the information listed in schedule 5 to this permit within the time period specified in that schedule.
- 4.3.3 Where the Environment Agency has requested in writing that it shall be notified when the operator is to undertake monitoring and/or spot sampling, the operator shall inform the Environment Agency when the relevant monitoring and/or spot sampling is to take place. The operator shall provide this information to the Environment Agency at least 14 days before the date the monitoring is to be undertaken.

- 4.3.4 The Environment Agency shall be notified within 14 days of the occurrence of the following matters, except where such disclosure is prohibited by Stock Exchange rules:

Where the operator is a registered company:

- (a) any change in the operator's trading name, registered name or registered office address; and
- (b) any steps taken with a view to the operator going into administration, entering into a company voluntary arrangement or being wound up.

Where the operator is a corporate body other than a registered company:

- (a) any change in the operator's name or address; and
- (b) any steps taken with a view to the dissolution of the operator.

In any other case:

- (a) the death of any of the named operators (where the operator consists of more than one named individual);
- (b) any change in the operator's name(s) or address (es); and
- (c) any steps taken with a view to the operator, or any one of them, going into bankruptcy, entering into a composition or arrangement with creditors, or, in the case of them being in a partnership, dissolving the partnership.

- 4.3.5 Where the operator proposes to make a change in the nature or functioning, or an extension of the activities, which may have consequences for the environment and the change is not otherwise the subject of an application for approval under the Regulations or this permit:

- (a) the Environment Agency shall be notified at least 14 days before making the change; and
- (b) the notification shall contain a description of the proposed change in operation.

- 4.3.6 The Environment Agency shall be given at least 14 days notice before implementation of any part of the site closure plan.

4.4 Interpretation

- 4.4.1 In this permit the expressions listed in schedule 6 shall have the meaning given in that schedule.
- 4.4.2 In this permit references to reports and notifications mean written reports and notifications, except where reference is made to notification being made "without delay", in which case it may be provided by telephone.

Schedule 1 - Operations

Table S1.1 activities

Activity reference	Activity listed in Schedule 1 to the EP Regulations	Description of specified activity	Limits of specified activity
A1	S5.1 A(1)(a)	The incineration of hazardous waste in a waste incineration plant or waste co-incineration plant with a capacity exceeding 10 tonnes per day	<p>Limited to flaring of waste gas, from onshore oil and gas exploration activities, produced from well testing activities using two enclosed ground flares.</p> <p>Flaring of gas shall be limited to a period of 90 days per well.</p> <p>Flaring of gas shall be limited to a maximum of 130,000 m³ per day</p> <p>Thereafter gas can only be flared where it is necessary to do so either as a safety measure or due to maintenance of surface equipment, unless otherwise approved in writing by the Environment Agency.</p> <p>There shall be no venting except where necessary for safety reasons.</p>

	Description of activities for waste operations	Limits of activities
A2	<p>The management of extractive waste from exploratory activities, not involving a waste facility.</p> <p>The management of extractive waste generated by well abandonment.</p>	<p>Permitted waste types shall conform to the description in the approved waste management plan.</p> <p>Drilling additives shall be approved in writing by the Environment Agency prior to use.</p> <p>No more than 3,000 cubic metres of flowback fluid shall be stored on site at any one time.</p>

A3	The management of extractive waste by way of a waste facility for hazardous waste	Permitted waste types shall conform to the description in the approved waste management plan.
		Drilling additives shall be approved in writing by the Environment Agency prior to use.
		All hazardous extractive waste must be stored in steel solid containers which are subject to annual non-destructive testing inspection and weekly visual inspection.
		Before the end of operation of the hazardous waste facility, all of the hazardous waste contents shall be taken off site to a permitted waste facility.
		No more than 275 tonnes of hazardous extractive waste shall be stored on site at any one time.
A4	The management of extractive waste by way of a waste facility for non-hazardous waste	Permitted waste types shall conform to the description in the approved waste management plan.
		Hydraulic fracturing additives shall be approved in writing by the Environment Agency prior to use.
A5	The injection of hydraulic fracturing fluid for exploration of hydrocarbons to ground via injection boreholes.	Discharge of hydraulic fracturing fluid for operations for the exploration of hydrocarbons to ground via four injection boreholes.
		The concentration of polyacrylamide shall be limited to 0.05% unless otherwise agreed in writing by the Environment Agency
		There shall be no injection of hydraulic fracturing fluid (which may include reused flow back fluid) for disposal.
		Hydraulic fracturing fluid shall not contain substances other than those additives approved in writing by the Environment Agency and flowback water that is suitable for reuse, produced from previous hydraulic fracturing events at this location.
		In the event of suspension of activities as required by the agreed hydraulic fracturing plan the well integrity of each injection boreholes shall be confirmed prior to resumption of activity A5 in accordance with the requirements in the WMP as referenced in table S1.2.

Table S1.2 Operating techniques

Activity reference	Description	Parts	Date Received
All	Application EPR/AB3101MW/A001	Form B3 Section 3 Operating Techniques; Table 3a Technical Standards	06/06/2014
All	Waste Management Plan Preston New Road Reference HSE-Permit-INS-PNR-006 Version 6	All of document	22/10/2014
A5	Schedule 5 response – groundwater and surface water determinands	All of document	14/08/2014
All	Site Shut Down Procedure as approved under PO1	All of document	Date of approval of PO1
A1	Environmental Management and Monitoring Plan as approved under PO2	All of document	Date of approval of PO2
A5	Hydraulic Fracturing Plan as approved under PO3	All of document	Date of approval of PO3
All	Groundwater Monitoring Plan as approved under PO4	All of document	Date of approval of PO4

Table S1.3 Pre-operational measures

Reference	Pre-operational measures
PO1	The Operator shall submit to the Environment Agency for approval a written Site Shut Down procedure to prevent unauthorised access to safety critical equipment and operational controls in case of a security breach and obtain the Environment Agency's written approval to it.
PO 2	At least 4 weeks prior to commencement of the gas flaring activity the operator shall submit to the Environment Agency for approval a written Environmental Management and Monitoring Plan (EMMP) which will include, but is not limited to: details of the baseline air quality study undertaken prior to activities commencing; details of the ambient air monitoring programme proposed for during and after the period of gas flaring; and shall obtain the Environment Agency's written approval to the EMMP.
PO 3	The Operator shall submit to the Environment Agency for approval a written Hydraulic Fracturing Plan (as referred to in Waste Management Plan (WMP) section 2.3) and obtained the Environment Agency's written approval to it.
PO 4	The operator shall submit for approval a written groundwater monitoring plan to include: Details of the proposed location; depth; construction and construction method of the monitoring boreholes with provision for the number of boreholes provided to increase as activities progress. 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. The operator shall obtain the Environment Agency's written approval to the groundwater monitoring plan.
PO 5	The injection boreholes shall be installed in accordance with condition 2.3.3 and following installation the Operator shall conduct a well integrity test on each borehole in accordance with section 2.4.4 of the Waste Management Plan.
PO 6	The Operator shall submit a written report to the Environment Agency for approval including the results of the integrity test carried out in accordance with PO5 and the as built construction and design details of the injection boreholes including the distance (in metres) below ground level of the laterals and the national grid references for each borehole and the end of each lateral for each borehole, and obtain the Environment Agency's written

	approval to the report.																																														
PO7	<p>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 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 borehole(s) in the form AB 12345 67890; (h) any other information obtained from the borehole(s) relevant to the interpretation of water sample analysis. 																																														
PO 8	<p>The Operator shall undertake at least 3 samples of groundwater from each monitoring borehole and 3 samples of surface water. Sampling, as a minimum, must include the parameters listed below and shall be carried out monthly over a minimum period of 3 months prior to the commencement of the drilling of the injection wells. The results of the groundwater and surface water monitoring shall be submitted to the Environment Agency.</p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Parameter</th> </tr> </thead> <tbody> <tr> <td>Acrylamide</td> <td>Dissolved Ethane</td> </tr> <tr> <td>Alkalinity (Total) as CaCO₃</td> <td>Dissolved Methane</td> </tr> <tr> <td>Ammoniacal Nitrogen as N</td> <td>Fluoride</td> </tr> <tr> <td>Arsenic</td> <td>Iron (Total)</td> </tr> <tr> <td>Aluminium</td> <td>Lead</td> </tr> <tr> <td>Antimony</td> <td>Lithium</td> </tr> <tr> <td>Barium</td> <td>Magnesium</td> </tr> <tr> <td>Beryllium</td> <td>Mercury</td> </tr> <tr> <td>BOD (settled)</td> <td>Nickel</td> </tr> <tr> <td>Boron</td> <td>Nitrate as NO₃</td> </tr> <tr> <td>Bromide</td> <td>Nitrite as NO₂</td> </tr> <tr> <td>δ¹³C-CH₄</td> <td>pH</td> </tr> <tr> <td>δ¹³C-CO₂</td> <td>Potassium</td> </tr> <tr> <td>Cadmium</td> <td>Salinity</td> </tr> <tr> <td>Calcium</td> <td>Selenium</td> </tr> <tr> <td>Carbon Dioxide</td> <td>Silver</td> </tr> <tr> <td>Chloride</td> <td>Sodium</td> </tr> <tr> <td>Chromium (Total)</td> <td>Strontium</td> </tr> <tr> <td>Cobalt</td> <td>TPH including Benzene, DRO (nC10 to nC24, GRO (nC5 to nC10), m/p Xylenes, o Xylene, MTBE, Toluene, Xylene, Ethyl Benzene.</td> </tr> <tr> <td>COD (settled)</td> <td>Total dissolved solids</td> </tr> <tr> <td>Copper</td> <td>Total suspended solids</td> </tr> <tr> <td>Dissolved Butane</td> <td>Vanadium</td> </tr> </tbody> </table>	Parameter	Parameter	Acrylamide	Dissolved Ethane	Alkalinity (Total) as CaCO ₃	Dissolved Methane	Ammoniacal Nitrogen as N	Fluoride	Arsenic	Iron (Total)	Aluminium	Lead	Antimony	Lithium	Barium	Magnesium	Beryllium	Mercury	BOD (settled)	Nickel	Boron	Nitrate as NO ₃	Bromide	Nitrite as NO ₂	δ ¹³ C-CH ₄	pH	δ ¹³ C-CO ₂	Potassium	Cadmium	Salinity	Calcium	Selenium	Carbon Dioxide	Silver	Chloride	Sodium	Chromium (Total)	Strontium	Cobalt	TPH including Benzene, DRO (nC10 to nC24, GRO (nC5 to nC10), m/p Xylenes, o Xylene, MTBE, Toluene, Xylene, Ethyl Benzene.	COD (settled)	Total dissolved solids	Copper	Total suspended solids	Dissolved Butane	Vanadium
Parameter	Parameter																																														
Acrylamide	Dissolved Ethane																																														
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Beryllium	Mercury																																														
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δ ¹³ C-CH ₄	pH																																														
δ ¹³ C-CO ₂	Potassium																																														
Cadmium	Salinity																																														
Calcium	Selenium																																														
Carbon Dioxide	Silver																																														
Chloride	Sodium																																														
Chromium (Total)	Strontium																																														
Cobalt	TPH including Benzene, DRO (nC10 to nC24, GRO (nC5 to nC10), m/p Xylenes, o Xylene, MTBE, Toluene, Xylene, Ethyl Benzene.																																														
COD (settled)	Total dissolved solids																																														
Copper	Total suspended solids																																														
Dissolved Butane	Vanadium																																														

	Dissolved Propane	Zinc	
PO 9	The Operator shall provide for approval a method for calculating the emissions from the flare as required by condition 3.5.8. and obtain the Environment Agency's written approval to the method.		

Schedule 2 - Waste types, raw materials and fuels

The disposal or recovery of non-extractive wastes are not permitted activities and there are no restrictions on raw materials or fuels under this schedule.

Schedule 3 – Emissions and monitoring

Table S3.1 point source emissions to air – emission limits and monitoring				
Emission point ref. and location	Parameter	Limit (including unit)	Monitoring frequency	Monitoring standard or method
A1 and A2 gas flares as shown on drawing HSE-Permit-INS-010_REV-B	Oxides of nitrogen	-	Monthly	As approved in writing with the Environment Agency in accordance with PO9
	Carbon monoxide	-	Monthly	As approved in writing with the Environment Agency in accordance with PO9
	Total volatile organic compounds (VOCs)	-	Monthly	As approved in writing with the Environment Agency in accordance with PO9
	Methane concentration in flare feed gas	-	Monthly	FTIR analyser in accordance with TGN M22
	Flare gas feed rate	130,000 m ³ per day	Continuous	As approved in writing with the Environment Agency
	Flare combustion temperature	minimum 800 °C	Continuous	PD ISO/TR 15377:2007

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements						
Discharge source and discharge point ref. & location	Parameter	Limit (incl. unit)	Reference Period	Limit of effective range	Monitoring frequency	Compliance statistic
The injection of hydraulic fracturing fluid for the operations for exploration of hydrocarbons to ground via injection boreholes	Maximum daily discharge volume	765 m ³ /day	Total daily volume	N/A	Continuous	Maximum
	Maximum rate of discharge	106.25 litres per second	Instantaneous (spot sample)	N/A	N/A	Maximum
	15-minute instantaneous or averaged flow	No limit set. Record as l/s	15 minute	N/A	Continuous	N/A
	Acrylamide	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Alkalinity (Total) as CaCO ₃	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A

Ammoniacal Nitrogen as N	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Arsenic	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Aluminium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Antimony	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Barium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Beryllium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
BOD (settled)	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Boron	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Bromide	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Cadmium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Calcium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Carbon Dioxide	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Chloride	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Chromium (Total)	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Cobalt	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
COD (settled)	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Copper	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Dissolved Butane	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Dissolved Propane	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Dissolved Ethane	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Dissolved Methane	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Fluoride	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Iron (Total)	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Lead	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Lithium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Magnesium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Mercury	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Nickel	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A

	Nitrate as NO3	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Nitrite as NO2	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	pH	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Potassium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Salinity	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Selenium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Silver	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Sodium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Strontium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	TPH including Benzene, DRO (nC10 to nC24, GRO (nC5 to nC10), m/p Xylenes, o Xylene, MTBE, Toluene, Xylene, Ethyl Benzene	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Total dissolved solids	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Total suspended solids	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Vanadium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Zinc	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A

Table S3.3 Discharge points			
Effluent Name	Discharge Point	Discharge point NGR	Receiving water/Environment
Hydraulic Fracturing fluid for exploration of hydrocarbons	Lateral 1 (along lateral borehole extending up to 2000m in a westerly direction from injection boreholes)	To be provided, see PO 6 in Table S1.3	Groundwater via lateral borehole constructed in Upper and Lower Bowland Shale and Hodder Mudstone Formation
	Lateral 2 (along lateral borehole extending up to 2000m in a westerly direction from the from injection boreholes)	To be provided, see PO 6 in Table S1.3	
	Lateral 3 (along lateral borehole extending up to 2000m in a westerly direction from the injection boreholes)	To be provided, see PO 6 in Table S1.3	
	Lateral 4 (along lateral borehole extending up to 2000m in a westerly direction from injection boreholes)	To be provided, see PO 6 in Table S1.3	

Table S3.4 Monitoring points			
Effluent name	Monitoring type	Monitoring point NGR	Monitoring point reference
Hydraulic fracturing fluid for exploration of hydrocarbons	Effluent sampling	SD 37408 32744	Effluent monitoring points centred on SD 37402 32755
	Flow monitoring	SD 37402 32755	Flow monitoring points centred on SD 37402 32755

Table S3.5 Surface water or groundwater monitoring requirements

Location or description of monitoring points	Parameter	Monitoring frequency	Monitoring standard or method	Other specifications
Groundwater monitoring borehole A1 at SD 37487 32739	See Table S1.2 Operating Techniques Schedule 5 response – Groundwater and Surface water determinands	Monthly prior to drilling injection boreholes, weekly during active operations (drilling / fracturing) and monthly thereafter unless otherwise agreed with the Environment Agency. Monitoring to be conducted concurrently.	BS ISO 5667 and condition 3.5.4	Three borehole volumes must be purged prior to sampling. Samples must be filtered samples.
Groundwater monitoring borehole A2 at SD 37435 32820				See section 9.10 of WMP referred to in Table S1.2
Groundwater monitoring borehole A3 at SD 37373 32666				
Surface water monitoring point B1 at SD 37528 32632	See Table S1.2 Operating Techniques Schedule 5 response – Groundwater and Surface water determinands		Condition 3.5.4	See section 9.11 of WMP referred to in Table S1.2
Surface water monitoring point B2 at SD 37738 33034				
Surface water monitoring point B3 at SD 37776 33283				
Surface water monitoring point B4 at SD 36840 33023				
Surface water monitoring point B5 at SD 36762 32749				
Surface water monitoring point B6 at SD 37042 32760				

Table S3.6 Process monitoring requirements				
Location or description of monitoring points	Parameter	Monitoring frequency	Monitoring standard or method	Other specifications
Buried microseismic array of 10 real time seismometers and 80 storage and harvest monitoring points.	Location, orientation and extent of induced fractures.	During the hydraulic fracturing events and in accordance with the an Hydraulic Fracture Plan (HFP) approved by the Environment Agency	As set out in the approved HFP	N/A
In accordance with the WMP as referenced in table S1.2 and table S3.2	Monitoring the quality of the flow back fluid	In accordance with the WMP as referenced in table S1.2	In accordance with the WMP as referenced in table S1.2	N/A
A1 and A2 gas flares as shown on drawing HSE-Permit-INS-010_REV-B	Flare gas feed rate	Continuous	As approved in writing with the Environment Agency.	N/A
A1 and A2 gas flares as shown on drawing HSE-Permit-INS-010_REV-B	Flare combustion temperature	Continuous	PD ISO/TR 15377:2007	N/A
A1 and A2 gas flares as shown on drawing HSE-Permit-INS-010_REV-B	Speciation and concentration of organic substances.	Monthly	As approved in writing with the Environment Agency in accordance with PO9.	N/A

Table S3.7 Ambient air monitoring requirements				
Location or description of point of	Parameter	Monitoring frequency	Monitoring standard or method	Other specifications
Locations specified in Agreed EMMP specified in table S1.2	Parameters specified in approved EMMP specified in table S1.2	Frequencies specified in approved EMMP specified in table S1.2	In accordance with condition 3.5.9 and EMMP specified in table s1.	N/A

Schedule 4 – Reporting

Parameters, for which reports shall be made, in accordance with conditions of this permit, are listed below.

Table S4.1 Reporting of monitoring data

Parameter	Emission or monitoring point/refere	Reporting period	Period begins
The following emissions to air parameters as required by condition 3.5.1.	Emission points: A1 and A2 gas flares as shown on drawing HSE-Permit-INS- 010_REV-B	Within 1 month of commencing flaring and then every month thereafter until cessation of flaring activities	Date of permit issue
Oxides of Nitrogen			
Carbon monoxide			
Total volatile organic compounds including methane			
Flare temperature	Monitoring points: A1 and A2 gas flares as shown on drawing HSE-Permit-INS- 010_REV-B	As required by the Environment Agency	Date of permit issue
Gas feed rate			
Total daily discharge volume of hydraulic fracturing fluid in Table S3.2	Flow monitoring points	Quarterly	Date of permit issue
Effluent parameters as listed in Table S3.2 under Parameters (excluding total daily volume)	Effluent sample points	Quarterly	Date of permit issue
Groundwater and surface water monitoring parameters as listed in Table S3.5 under Parameters	Monitoring points as indicated in Table S3.2	Quarterly	Date of permit issue
Process monitoring parameters Location, orientation and extent of induced fractures and monitoring the quality of the flow back fluid as listed in Table S3.6	Description as indicated in Table S3.6	Quarterly	Date of issue of permit

Table S4.2 Reporting forms

Media/parameter	Reporting format	Date of form
Air	Form Air1 or other form as agreed in writing by the Environment Agency	DD/MM/YY
Total daily volume	WISKI electronic format specified by the Environment Agency	DD/MM/YY
15 minute flow	WISKI electronic format specified by the Environment Agency	DD/MM/YY
Effluent parameters as listed in Table S3.2 under Parameters (excluding total daily volume)	Form as agreed in writing with the Environment Agency	DD/MM/YY

Table S4.2 Reporting forms

Groundwater and surface water monitoring parameters as listed in table S3.5 under Parameters	Form Groundwater1 or other form as agreed in writing by the Environment Agency	DD/MM/YY
Process monitoring parameters Location, orientation and extent of induced fractures and monitoring the quality of the flow back fluid as listed in Table S3.6	Form as agreed in writing with the Environment Agency	DD/MM/YY
Other performance indicators	Form performance 1 or other form as agreed in writing by the Environment Agency	DD/MM/YY

Schedule 5 - Notification

These pages outline the information that the operator must provide.

Units of measurement used in information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

If any information is considered commercially confidential, it should be separated from non-confidential information, supplied on a separate sheet and accompanied by an application for commercial confidentiality under the provisions of the EP Regulations.

Part A

Permit Number	
Name of operator	
Location of Facility	
Time and date of the detection	

(a) Notification requirements for any activity that gives rise to an incident or accident which significantly affects or may significantly affect the environment	
To be notified Immediately	
Date and time of the event	
Reference or description of the location of the event	
Description of where any release into the environment took place	
Substances(s) potentially released	
Best estimate of the quantity or rate of release of substances	
Measures taken, or intended to be taken, to stop any emission	
Description of the failure or accident.	

(b) Notification requirements for the breach of a permit condition	
To be notified immediately	
Emission point reference/ source	
Parameter(s)	
Limit	
Measured value and uncertainty	
Date and time of monitoring	
Measures taken, or intended to be taken, to stop the emission	

Time periods for notification following detection of a breach of a limit	
Parameter	Notification period
In the event of a breach of permit condition which poses an immediate danger to human health or threatens to cause an immediate significant adverse effect on the environment:	
Description of where the effect on the environment was detected	
Substances(s) detected	
Concentrations of substances detected	
Date of monitoring/sampling	

Part B - to be submitted as soon as practicable

Any more accurate information on the matters for notification under Part A.	
Measures taken, or intended to be taken, to prevent a recurrence of the incident	
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission	
The dates of any unauthorised emissions from the facility in the preceding 24 months.	

Name*	
Post	
Signature	
Date	

* authorised to sign on behalf of the operator

Schedule 6 - Interpretation

“accident” means an accident that may result in pollution.

“application” means the application for this permit, together with any additional information supplied by the operator as part of the application and any response to a notice served under Schedule 5 to the EP Regulations.

“Annex I” means Annex I to Directive 2008/98/EC of the European Parliament and of the Council on waste.

“Annex II” means Annex II to Directive 2008/98/EC of the European Parliament and of the Council on waste.

“annually” means once every year.

“approved waste management plan” means a plan of the type described in Article 5(1) of Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC, approved as part of the grant or variation of an environmental permit and as revised from time to time.

“aquifer” means a subsurface layer or layers of rock or other geological strata of sufficient permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater (WFD Art 2.11).

“authorised officer” means any person authorised by the Environment Agency under section 108(1) of The Environment Act 1995 to exercise, in accordance with the terms of any such authorisation, any power specified in section 108(4) of that Act.

“emissions to land” includes emissions to groundwater.

“emissions of substances not controlled by emission limits” means emissions of substances to air, water or land from the activities, either from the emission points specified in schedule 3 or from other localised or diffuse sources, which are not controlled by an emission or background concentration limit.

“EP Regulations” means The Environmental Permitting (England and Wales) Regulations SI 2010 No.675 and words and expressions used in this permit which are also used in the Regulations have the same meanings as in those Regulations.

“exploration” means 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” means waste resulting from the prospecting, extraction, treatment and storage of mineral resources and the working of quarries, excluding waste which does not directly result from these operations.

“groundwater” means all water, which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.

“injection borehole” the borehole used to carry out the hydraulic fracturing by injecting fluid into the target formation.

“Industrial Emissions Directive” means DIRECTIVE 2010/75/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 on industrial emissions

“MCERTS” means the Environment Agency’s Monitoring Certification Scheme.

“mining waste facility” means a waste facility as defined in Article 3(15) of Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC, where a mining waste operation is carried out.

“prospecting” means prospecting as 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 directly associated with an extractive operation.

“quarter” means a calendar year quarter commencing on 1 January, 1 April, 1 July or 1 October.

“requisite surveillance” means the monitoring of groundwater that is required, in particular its quality, to ensure groundwater is not impacted by the permitted activity. It is the monitoring necessary to confirm control measures are working and there is no pollution of groundwater occurring.

“significant pollution” means a category 1 or category 2 incident indicated by the Common Incident Classification Scheme (CICS).

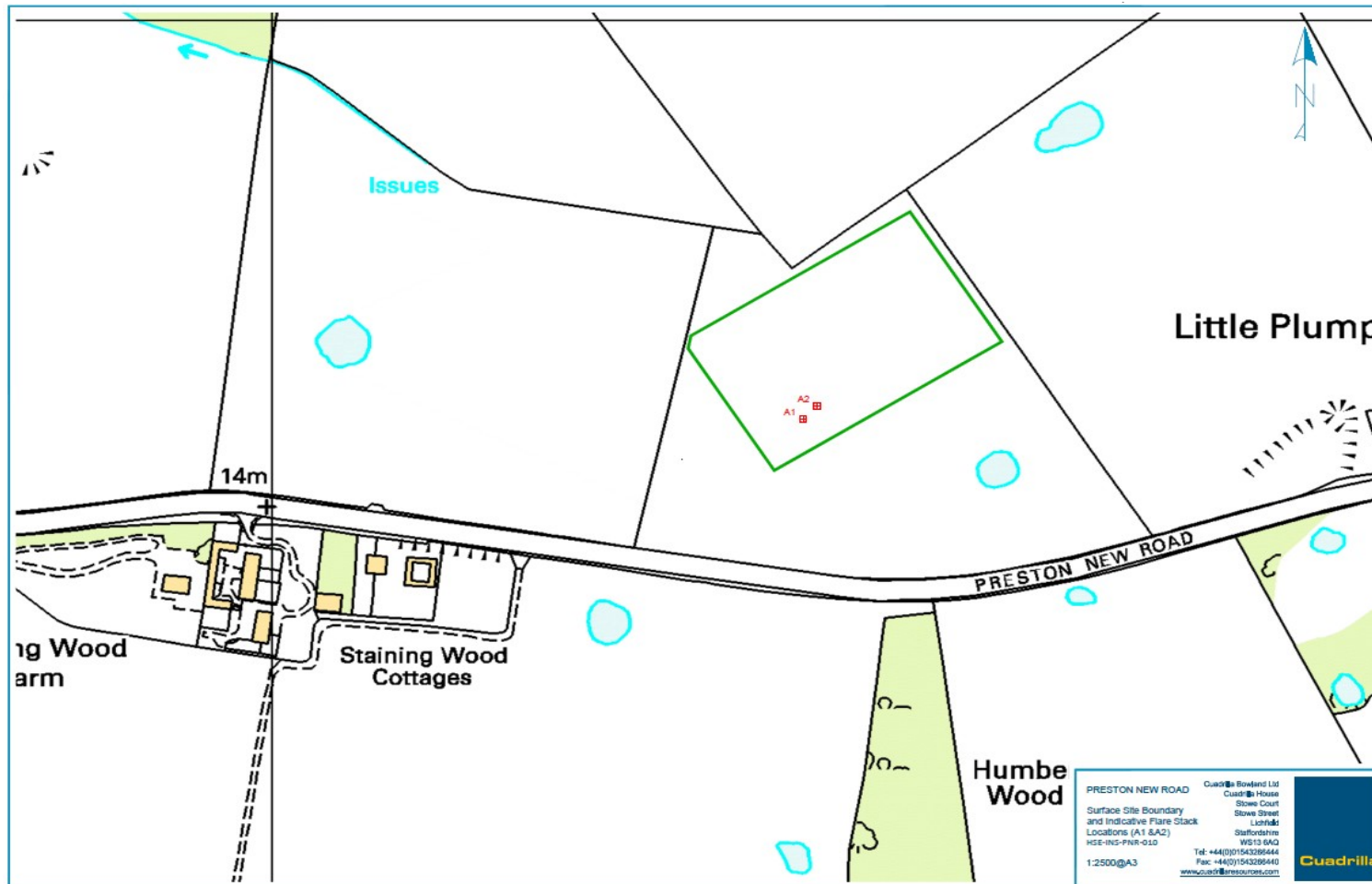
“year” means calendar year ending 31 December.

Where a minimum limit is set for any emission parameter, for example pH, reference to exceeding the limit shall mean that the parameter shall not be less than that limit.

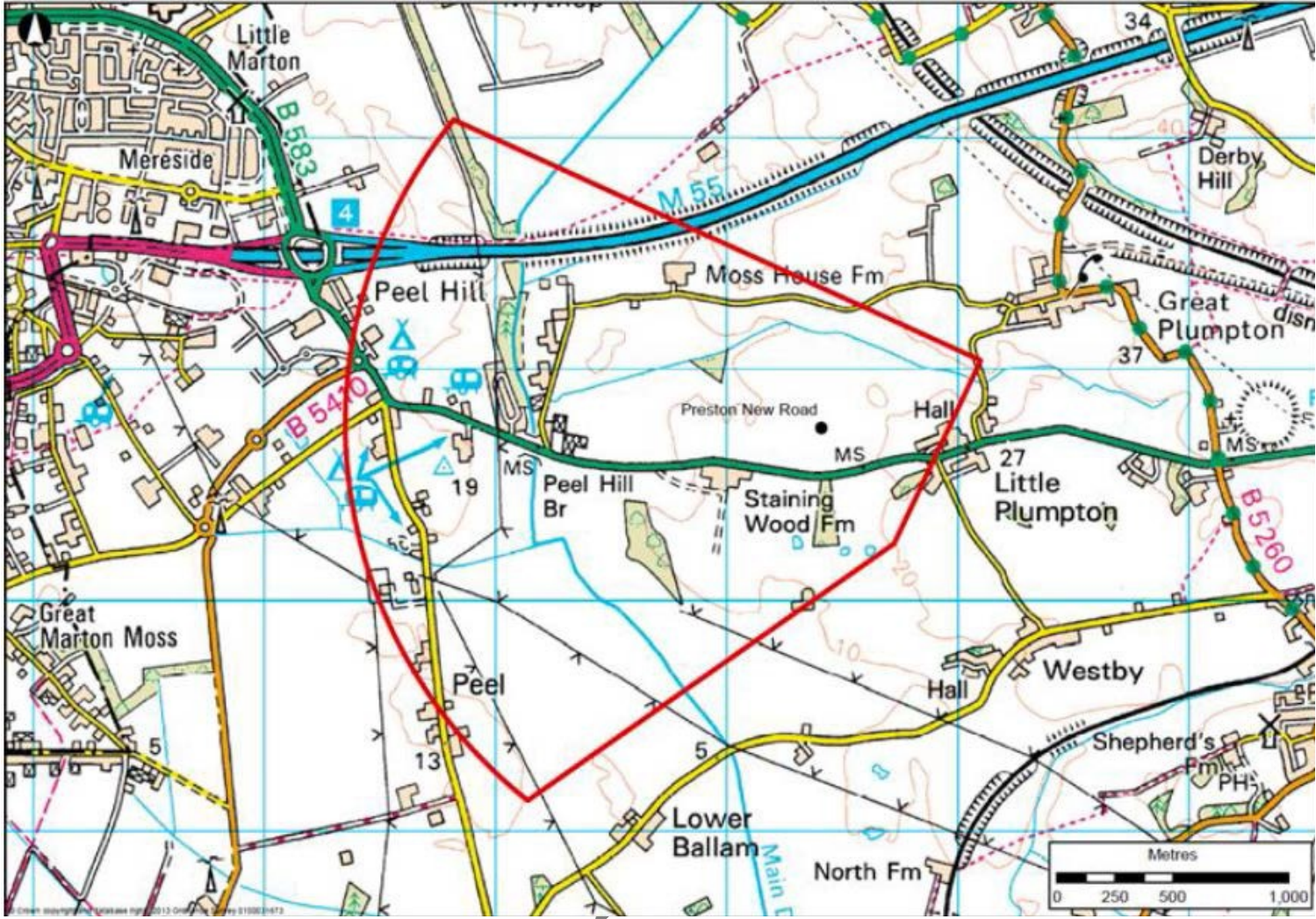
Unless otherwise stated, any references in this permit to concentrations of substances in emissions into air means:

- (a) in relation to emissions from combustion processes, the concentration in dry air at a temperature of 273K, at a pressure of 101.3 kPa and with an oxygen content of 3% dry for liquid and gaseous fuels, 6% dry for solid fuels; and/or
- (b) in relation to emissions from non-combustion sources, the concentration at a temperature of 273K and at a pressure of 101.3 kPa, with no correction for water vapour content.

Schedule 7 - Site plan



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END OF PERMIT

Permit Number : EPR/AB3101MW **Operator:** Cuadrilla Bowland Limited

Facility : Preston New Road Exploration Site **Form Number:** Air1

Reporting of emissions to air for the period from DD/MM/YYYY to DD/MM/YYYY

Emission Point	Substance / Parameter	Emission Limit Value	Reference Period	Result ^[1]	Test Method ^[2]	Sample Date and Times ^[3]	Uncertainty ^[4]

- 1) The result given is the maximum value (or the minimum value in the case of a limit that is expressed as a minimum) obtained during the reporting period, expressed in the same terms as the emission limit value. Where the emission limit value is expressed as a range, the result is given as the 'minimum – maximum' measured values.
- 2) Where an internationally recognised standard test method is used the reference number is given. Where another method that has been formally agreed with the Environment Agency is used, then the appropriate identifier is given. In other cases the principal technique is stated, for example gas chromatography.
- 3) For non-continuous measurements the date and time of the sample that produced the result is given. For continuous measurements the percentage of the process operating time covered by the result is given.
- 4) The uncertainty associated with the quoted result at the 95% confidence interval, unless otherwise stated.

Signed
(Authorised to sign as representative of Operator)

Date.....

Permit Number : EPR/AB3101MW **Operator:** Cuadrilla Bowland Limited

Facility : Preston New Road Exploration Site **Form Number:** Groundwater1

Reporting of groundwater monitoring for the period from DD/MM/YYYY to DD/MM/YYYY

Monitoring Point (as agreed under pre-operational condition 2.4.1)	Substance / Parameter (as listed in table S3.2)	Trigger level (To be determined and agreed following submission and review of baseline groundwater quality data required under pre-operational condition 2.4.1.)	Reference Period	Result ^[1]	Test Method ^[2]	Sample Date and Times ^[3]	Uncertainty ^[4]

- 1) The result given is the maximum value (or the minimum value in the case of a limit that is expressed as a minimum) obtained during the reporting period, expressed in the same terms as the emission limit value. Where the emission limit value is expressed as a range, the result is given as the ‘minimum – maximum’ measured values.
- 2) Where an internationally recognised standard test method is used the reference number is given. Where another method that has been formally agreed with the Environment Agency is used, then the appropriate identifier is given. In other cases the principal technique is stated, for example gas chromatography.
- 3) For non-continuous measurements the date and time of the sample that produced the result is given. For continuous measurements the percentage of the process operating time covered by the result is given.
- 4) The uncertainty associated with the quoted result at the 95% confidence interval, unless otherwise stated.

Signed
(Authorised to sign as representative of Operator)

Date.....

