



This form will report compliance with your permit as determined by an Environment Agency officer

Site	Preston New Road Exploration Site EPR/AB3101MW		Permit Ref	UP3431VF		
Operator/ Permit holder	Cuadrilla Bowland Limited					
Date	19/10/2018		Time in	09:40	Out	15:15
What parts of the permit were assessed	Activity A5 - injection of hydraulic fracturing fluid and groundwater sampling					
Assessment	Audit	EPR Activity:	Installation	X	Waste Op	Water Discharge
Recipient's name/position	HSE&P Manager					
Officer's name	EA Installations, Groundwater specialists		Date issued	15/11/2018		

Section 1 - Compliance Assessment Summary

This is based on the requirements of the permit under the Environmental Permitting Regulations. A detailed explanation and any action you may need to take are given in the "Detailed Assessment of Compliance" (section 3). This summary details where we believe any non-compliance with the permit has occurred, the relevant condition and how the non-compliance has been categorised using our [Compliance Classification Scheme](#) (CCS). CCS scores can be consolidated or suspended, where appropriate, to reflect the impact of some non-compliances more accurately. For more details of our CCS scheme, contact your [local office](#).

Permit Conditions and Compliance Summary

Condition(s) breached

Permit Condition	Compliance	Condition(s) breached
a) Permitted activities	1. Specified by permit	A
b) Infrastructure	1. Engineering for prevention & control of pollution	N
	2. Closure & decommissioning	NA
	3. Site drainage engineering (clean & foul)	A
	4. Containment of stored materials	N
	5. Plant and equipment	N
c) General management	1. Staff competency/ training	N
	2. Management system & operating procedures	A
	3. Materials acceptance	N
	4. Storage handling, labelling, segregation	N
d) Incident management	1. Site security	N
	2. Accident, emergency & incident planning	N
e) Emissions	1. Air	N
	2. Land & Groundwater	A
	3. Surface water	N
	4. Sewer	N
	5. Waste	N
f) Amenity	1. Odour	N
	2. Noise	N
	3. Dust/fibres/particulates & litter	N
	4. Pests, birds & scavengers	N
	5. Deposits on road	N
g) Monitoring and records, maintenance and reporting	1. Monitoring of emissions & environment	C4
	2. Records of activity, site diary, journal & events	N
	3. Maintenance records	N
	4. Reporting & notification	N
h) Resource efficiency	1. Efficient use of raw materials	N
	2. Energy	N

KEY: C1, C2, C3, C4 = CCS breach category (* suspended scores are marked with an asterisk), A = Assessed (no evidence of non-compliance), N = Not assessed, NA = Not Applicable, O = Ongoing non-compliance – not scored

Number of breaches recorded	1	Total compliance score (see section 5 for scoring scheme)	0.1
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If the Total No Breaches is greater than zero, then please see Section 3 for details of our proposed enforcement response

Section 2 – Compliance Assessment Report Detail

This section contains a report of our findings and will usually include information on:

- the part(s) of the permit that were assessed (e.g. maintenance, training, combustion plant, etc)
- where the type of assessment was 'Data Review' details of the report/results triggering the assessment
- any non-compliances identified
- any non-compliances with directly applicable legislation
- details of any multiple non-compliances
- information on the compliance score accrued inc. details of suspended or consolidated scores.
- details of advice given
- any other areas of concern
- all actions requested
- any examples of good practice.
- a reference to photos taken

This report should be clear, comprehensive, unambiguous and normally completed within 14 days of an assessment.

Activity A5

This audit was to review the injection of hydraulic fracturing fluid under permitted activity A5. Checking that fractures remain within the sub-surface permit boundary has not been included as part of this audit as it is covered by HFP compliance assessment visits and daily reports.

The "*Hydraulic Fracturing Programme*" document, which forms part of Cuadrilla's management system sets out the objectives for each day. This is discussed with Cuadrilla's contractor who executes the plan. The procedure titled "*Instruction: Compliance for pumping*" also sets out the pumping volumes, rates, hydraulic fracturing fluid composition, sampling and reporting. These procedures were referred to throughout the audit.

EA officers attended the daily safety briefing prior to activities commencing where all contractors involved in the process are briefed on the plans.

Action: Confirm that the "*Instruction: Compliance for pumping*" procedure forms part of your Environmental Management System.

Hydraulic Fracturing Fluid composition and approved additives

Activity A5 in the permit sets out that "*The concentration of polyacrylamide shall be limited to 0.05% unless otherwise agreed in writing by the Environment Agency*".

The "*Instruction: Compliance for Pumping*" document sets out the hydraulic fracturing fluid composition including water and sand (99.95% by volume) and friction reducer (maximum concentration 0.05% by volume).

The substances below have been approved for use during the hydraulic fracturing phase of operations.

A water friction reducing agent which contains polyacrylamide.

The use of hydrochloric acid in a weak solution of 10% has also been approved for use to facilitate entry of the fracturing fluid.

A walkover of the area around the mixing truck was undertaken and the process of mixing the hydraulic fracturing fluid explained. No other additives were observed. All flowback of fracturing fluid from the well or from the formation has been reused in the fracturing process and therefore no waste flowback had been produced to date.

Officers discussed the make-up of hydraulic fracturing fluid with a contractor tasked to carry out the work. The addition of the friction reducing agent (of which polyacrylamide is a component) is measured by weight and flow (by turn of screw) therefore a known volume and weight is pumped to each volume of water pumped. The weights and volumes were recorded by the operator and these records were viewed, however, on the record sheet, the calculated *concentration* of friction reducer / poly-acrylamide was not recorded. This is quality checked throughout each stage of hydraulic fracturing. **Recommendation: to include on these records the calculated concentration of friction reducer / polyacrylamide so that it is auditable and demonstrated to be below 0.05% as required by the permit.**

The controls in place were demonstrated on the computer system and several points of restriction were in place. The friction reducer is delivered by an auger that gives a defined mass per turn. The mass required (and therefore number of turns) is defined by the volume of water to be pumped to give a percentage. These controls ensure that the concentration of polyacrylamide does not exceed the 0.05% set in the permit.

Discussed how the reuse of returned fluids, which already contain poly-acrylamide, did not lead to an accumulation upon reuse. The concentration of friction reducer used is less than half of the 0.05% permitted and only trace amounts of polyacrylamide are returned in flowback. It is not possible to quantify the concentration of polyacrylamide in the return fluids as it is not measureable. Therefore the concentration of polyacrylamide is kept below the permitted 0.05% by ensuring that less than 0.025% is routinely used which is measured by weight and volume during the fracturing fluid make up.

Action: Test using a calculation to determine the percentage of friction reducer (and therefore polyacrylamide)

when flowback is being used as part of the fracturing fluid. Determine whether this calculation can be used routinely to measure the percentage of polyacrylamide in reused flowback fluid.

It was agreed that the concentration of friction reducer will be included on the daily morning reports going forward. The reports since the audit have been checked and this has been included.

Discharge Volume and Rate

Table S3.2 of the permit sets out the maximum discharge volume, maximum rate of discharge and the requirement to monitor the 15-minute instantaneous or average flow of the injection of hydraulic fracturing fluid.

Permit condition 3.5.4 states “

“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.”

As the flow meter in place is not MCERTS certified, a letter from Cuadrilla dated 10 October 2018 describes how Cuadrilla will measure the discharge rate of injected hydraulic fracturing fluid in line with Table S3.2 and permit condition 3.5.4. The Environment Agency accepted the methodology on 11 October 2018. In the letter, Cuadrilla commit to a maximum discharge rate limited to 90l/s (5.4m³/min) as opposed to 106.25l/s listed in Table S3.2 of the permit until the ADMAG flow meter is verified or certified. This is compliant with condition 3.5.4 and has been included in the *“Instruction: Compliance for Pumping” procedure.*

During the audit, it was discussed that the ADMAG flow meter only measures the “slurry rate” which is the hydraulic fracturing fluid pumped down the annulus of the well. In addition to this, water mixed with friction reducer, is also pumped down the Coil Tubing (CT) inside the well to ensure the integrity of the Coil Tubing throughout the pumping phase. The CT flow is fed from tanks separate to the frac fluid pumps. It is mainly used to pressurise the tubing during frac fluid injection in the annulus to avoid collapse. It was also used for the initial mini fracs and would be used in the event of a screen out to clear the sand. This fluid will also end up at the base of the well and be mixed with the annular fracturing fluid entering the formation. Whilst this is low volumes, the total recorded flow rate of hydraulic fracturing fluid injected as listed in Table S3.2 should be the sum of the two – CT injection rate and the pumped fracturing fluid rate measured by the ADMAG meter (shown as “slurry rate”).

Subsequent to the audit, Cuadrilla clarified the CT injection rate in a letter dated 22 October 2018 and stated that it was measured by pump strokes. Cuadrilla agreed that the total injection rate will be below the 90l/s (5.4m³/min) and will be shown in the daily report.

Following enquiries, the Environment Agency found that the CT flow rate is measured primarily by pump stroke, but that there is an additional flow meter in place. This is a Micro Motion flowmeter. **However, this flowmeter, or the method of measuring flow by pump stroke, is not MCERTS certified/accredited in line with permit condition 3.5.4. This is recorded as a Category 4 breach of this condition as the total injection rate in to the formation is not measured by an MCERTS certified/accredited flow meter nor has it been agreed in writing by the Environment Agency prior to hydraulic fracturing. This breach constitutes a minor non-compliance with no environmental impact.**

The action below constitutes our response to the letter from 22 October.

Action:

Further information and confirmation is required from the operator regarding the Micro Motion flow meter:

- **Provide the make, model and certifications/standards of the installed flowmeter;**
- **Confirmation of the suitability of this model for the pressures and rates used on site;**
- **Confirmation that the installation of flowmeter meets manufacturers requirements;**
- **Dates of the last calibration of the flowmeter (please supply records);**
- **Confirmation of how the flow is recorded and retained on the process software;**
- **Confirmation that the flowmeter will be included in the agreed (11 October) verification exercise following the fracturing programme of Well 1z.**
- **Include reference to both the CT rate and slurry rate (i.e. total injection rate) in your procedure *“Instruction: Compliance for Pumping”*.**

This information should be included in an update to the letter dated 22 October which must be submitted before the next stage of hydraulic fracturing.

During the audit on 19 October two mini fractures were undertaken. During this process the monitoring screens in the visitor's centre were viewed. The required discharge rates and volumes were displayed on the screen so that compliance against the permit requirements are monitored.

The total injection rates are recorded for each fracturing stage and were reviewed for each stage. All have been reviewed and were below 90l/s (5.4m³/min).

Recommendation: The total injection rate (CT injection rate plus slurry rate) should be shown on the daily reports for each fracturing stage to confirm that the rates were below the agreed 90l/s.

Sampling of Hydraulic Fracturing Fluid

Table S3.2 in the environmental permit sets out the requirement to take a weekly sample of the hydraulic fracturing fluid.

"Instruction: Compliance for Pumping" sections 1.4 and 1.5 set out the sampling of the fracturing fluid. The sample is taken by Cuadrilla's contractor from a sampling point on the hydraulic fracturing fluid mixing truck (previously inspected) which is witnessed by and handed to a third party to undertake the chain of custody and delivery to the laboratory for analysis. Site health and safety requirements dictate that the sample cannot be physically taken by the contractor as the sample point is naturally within an area of high pressure pipework. Officers were also shown the agreement between Cuadrilla and the third party. More regular samples are also taken by Cuadrilla and held on site for analysis if required.

The first sample was taken on 17 October 2018. This was of fracturing fluid without proppant as only mini-fracs had taken place at the time. The Chain of Custody document was viewed for this sample. The analysis of this sample was not yet available at the time of the inspection and will be reviewed during a follow-up inspection.

Groundwater Sampling

Table S3.5 of the Environmental Permit specified weekly groundwater sampling during active operations of boreholes BH01- BH04. The table sets out that the samples should be collected in line with BS ISO 5667 and must be filtered for specific determinants. This audit assessed the collection of samples from the boreholes by the contractors. A review of the collected data, laboratory accreditation and chain of custody will be carried out in due course.

Cuadrilla's contractors were on site undertaking the weekly groundwater sampling. Boreholes BH01, BH03 and BH04, were sampled on Thursday 18 October 2018 and the BH02 was being sampled during the audit. This was the third week of the weekly sampling regime.

The contractor's "Groundwater Monitoring Method Statement (August 2016)" for sampling was provided to EA officers for review. The procedure included Cuadrilla's "*PNR Groundwater Monitoring Plan*" dated March 2016 as an appendix.

This Method Statement outlines how the sampling methods employed on site are compliant with the proposals outlined in Cuadrilla's "*PNR Groundwater Monitoring Plan*". For clarity, the document refers to British Standard BS 6068-6 parts 1, 3 & 11. These British Standards are the UK implementation of EN ISO 5667 as referred to in Cuadrilla's groundwater monitoring plan.

The sampling methods outlined in the document and those witnessed and employed on site are considered to be compliant with BS 6068-6.11:2009 & BS ISO 5667-11:2009 Guidance on the sampling of groundwater.

Cuadrilla's "*Surface Water and Groundwater Monitoring*" document dated June 2017 and "*PNR Groundwater Monitoring Plan*" dated March 2016 sets out that groundwater quality parameters / indicators will be monitored during sampling, including temperature, pH, electrical conductivity and redox potential (dissolved oxygen). These parameters were being monitored using a probe connected to a wireless unit which keeps a record of the readings. A back-up is also taken by the samplers in their notebooks. The probe is calibrated monthly. Table 2 of the "*PNR Groundwater Monitoring Plan*" sets out the stabilisation targets for each parameter. The readings on the wireless unit were within the targets set out in the procedure.

Officers witnessed the samples being taken for all parameters. The contractor explained the bottles being used for each analysis and were able to explain the techniques used for each type of analysis. The samples taken for metals analysis were witnessed being filtered as required and samples for dissolved gasses were checked for air bubbles. None were present. The contractor intended to send the samples to the laboratory by courier the same day. The groundwater sampling was being undertaken in line with the environmental permit, Cuadrilla's and Cuadrilla's Contractor's procedures.


Recommendation: The total depth of the boreholes is not routinely dipped as part of the groundwater sampling. It

would be advisable to occasionally measure the total depth of the boreholes to ensure that they are not silting up. Cuadrilla's contractors said that they had not seen any evidence of the wells silting up during their sampling.

Other observations

During the audit, the open section of the drainage ditch and external banking outside of the site along this section of the boundary was inspected. No issues were identified with the containment of the site and no leaks were noted. Photographs were taken of the sections inspected. A further inspection of containment will be conducted during a later site visit.



 Environment Agency	EPR Compliance Assessment Report	Report ID: UP3431VF/0317137	
This form will report compliance with your permit as determined by an Environment Agency officer			
Site	Preston New Road Exploration Site EPR/AB3101MW	Permit	UP3431VF
Operator/ Permit	Cuadrilla Bowland Limited	Date	19/10/2018

Section 3- Enforcement Response**Only one of the boxes below should be ticked**

You must take immediate action to rectify any non-compliance and prevent repetition. Non-compliance with your permit conditions constitutes an offence and can result in criminal prosecutions and/or suspension or revocation of a permit. Please read the detailed assessment in Section 2 and the steps you need to take in Section 4 below.

Other than the provision of advice and guidance, at present we do not intend to take further enforcement action in respect of the non-compliance identified above. This does not preclude us from taking enforcement action if further relevant information comes to light or advice isn't followed.

X

In respect of the above non-compliance you have been issued with a warning. At present we do not intend to take further enforcement action. This does not preclude us from taking additional enforcement action if further relevant information comes to light or offences continue.

We will now consider what enforcement action is appropriate and notify you, referencing this form.

Section 4- Action(s)

Where non-compliance has been detected and an enforcement response has been selected above, this section summarises the steps you need to take to return to compliance and also provides timescales for this to be done.

Criteria Ref.	CCS Category	Action Required / Advised	Due Date
See Section 1 above			
G1	C4	See actions specified in Section 2	N/A

Section 5 - Compliance notes for the Operator

To ensure you correct actual or potential non-compliance we may

- advise on corrective actions verbally or in writing
- require you to take specific actions in writing
- issue a notice
- require you to review your procedures or management system
- change some of the conditions of your permit
- decide to undertake a full review of your permit

Any breach of a permit condition is an offence and we may take legal action against you.

● We will normally provide advice and guidance to assist you to come back into compliance either after an offence is committed or where we consider that an offence is likely to be committed. This is without prejudice to any other enforcement response that we consider may be required.

● Enforcement action can include the issue of a formal caution, prosecution, the service of a notice and or suspension or revocation of the permit.

● A civil sanction Enforcement Undertaking (EU) offer may also be available to you as an alternative enforcement response for this/these offence(s).

See our Enforcement and Civil Sanctions guidance for further information

This report does not relieve the site operator of the responsibility to

- ensure you comply with the conditions of the permit at all times and prevent pollution of the environment
- ensure you comply with other legislative provisions which may apply.

Non-compliance scores and categories

CCS category	Description	Score
C1	A non-compliance which could have a major environmental effect	60
C2	A non-compliance which could have a significant environmental effect	31
C3	A non-compliance which could have a minor environmental effect	4
C4	A non-compliance which has no potential environmental effect	0.1

Operational Risk Appraisal (Opra) - Compliance assessment findings may affect your Opra score and/or your charges. This score influences the resource we use to assess permit compliance.

Section 6 – General Information

Data protection notice

The information on this form will be processed by the Environment Agency to fulfill its regulatory and monitoring functions and to maintain the relevant public register(s). The Environment Agency may also use and/or disclose it in connection with:

- offering/providing you with its literature/services relating to environmental matters
- consulting with the public, public bodies and other organisations (e.g. Health and Safety Executive, local authorities) on environmental issues
- carrying out statistical analysis, research and development on environmental issues
- providing public register information to enquirers
- investigating possible breaches of environmental law and taking any resulting action
- preventing breaches of environmental law
- assessing customer service satisfaction and improving its service
- Freedom of Information Act/Environmental Information Regulations request.

The Environment Agency may pass it on to its agents/representatives to do these things on its behalf. You should ensure that any persons named on this form are informed of the contents of this data protection notice.

Disclosure of information

The Environment Agency will provide a copy of this report to the public register(s). However, if you consider that any information contained in this report should not be released to the public register(s) on the grounds of commercial confidentiality, you must write to your local area office within 28 days of receipt of this form indicating which information it concerns and why it should not be released, giving your reasons in full.

Customer charter

What can I do if I disagree with this compliance assessment report?

If you are unable to resolve the issue with your site officer, you should firstly discuss the matter with the officer's line managers. If you wish to raise your dispute further through our official Complaints and Commendations procedure, phone our general enquiry number 03708 506 506 (Mon to Fri 08.00–18.00) and ask for the Customer Contact team or send an email to enquiries@environment-agency.gov.uk. If you are still dissatisfied, you can make a complaint to the Ombudsman. For advice on how to complain to the [Parliamentary and Health Service Ombudsman](#) phone their helpline on 0345 015 4033.