

9 May 2019

The Information Commissioner,
Information Commissioner's Office,
Wycliffe House,
Water Lane,
Wilmslow,
Cheshire,
SK9 5AF.

Dear Madam,

FOI-2018-0055

NB: In this document

- "CPRE" denotes the Campaign to Protect Rural England's Lancashire Branch of, which is a company limited by guarantee and a registered charity,
- "Cuadrilla" denotes Cuadrilla Bowland Limited or Cuadrilla Resources Limited,
- "PNR" denotes Cuadrilla's Preston New Road site,
- "OGA" acronym for the Oil and Gas Authority, and
- "PEDL" acronym for Petroleum Exploration and Development Licence.

A. Reasons for this referral to the ICO

1. Following review of the OGA's FOI Officer's response to CPRE's FOIA enquiry, the OGA's FOI Manager found that it was no longer necessary to withhold any of the information that CPRE had requested, and all the requested information has now been disclosed.
2. However, the process of achieving this result has revealed serious inadequacies in the way the OGA responds to FOIA and EIR enquiries, and this is one of the reasons why I am referring the matter to the ICO on behalf of CPRE.
3. CPRE, like many voluntary bodies, is very hard pressed responding to the many initiatives which are of concern to it and it should not have had to expend considerable effort in countering a secretive OGA seeking to deny legitimate access to information.
4. Our several motivations in making this referral to the ICO are twofold in character, viz. a) those which are specific to this FOIA enquiry and should have

not met with resistance by the OGA, and b) those which involve matters of principle of general applicability concerning the way commercial confidentiality is affecting how onshore exploration for petroleum products is regulated and on which we seek adjudication by the ICO.

B. Criticisms of the OGA specific to this case.

5. At the time the OGA received CPRE's FOIA enquiry, it knew that the OGA approved hydraulic fracture plan (HFP) was already in the public domain, that Cuadrilla's completion application could be made public, and that the only two documents which it did not wish to disclose, namely, the "Well Completion" and the "Extended Well Test" applications, together consisted of only nine A4 pages. Thus, we believe that the OGA at the very least misdirected itself, or even was guilty of a deception, in claiming that the complexity and volume of the information we requested was of a scale which justified their invoking EIR Regulation 7 allowing them 40 days in which to respond to our enquiry, rather than the customary 20 days.
6. In requesting the OGA FOI Manager for an internal review (please see Appendix 1), we had hoped that the matter complained of in the previous paragraph would be corrected. However, in par. 11 of his response (please see Appendix 2), Hedvig Ljungerud, the OGA's Director of Strategy, makes it clear that he regarded invoking Regulation 7 was a valid reason for extending the time for response to our enquiry by a further 20 days. Accordingly, we earnestly request that the ICO will explain to the OGA how the OGA has a duty to respond to FIOA and EIR enquiries in a responsible and honest way.
7. Concerning the "Well Completion" and the "Extended Well Test" applications, we do not believe denying public access to either document on the grounds of the commercial confidentiality of the information therein was ever justified, given the information in Cuadrilla's planning application and the HFP. In denying access to the documents, we believe that the OGA should have indicated specifically the type of information which it claimed made these documents commercially confidential; we are strengthened in this view by being unaware of any recent statements by Cuadrilla which bear on the confidentiality or otherwise of these documents (and we diligently try to keep track of Cuadrilla's public statements). Accordingly, we ask the ICO to give guidance to the OGA on how it needs to be specific when justifying its decision to deny access to a document on the grounds of commercial confidentiality.

C. The issue of commercial confidentiality arising from the interests of sub contractors

8. The purpose of this section is to explain why CPRE believes that the PEDL licensee/developer should be responsible for the actions and omissions of its contractors and that the terms of engagement of contractors should make that clear. Thus, any observational data supplied by a contractor, or the results of the analysis of those data, should be the property of the PEDL licensee/developer, and not be capable of being embargoed in the commercial interest of the contractor. Likewise, any document specifying procedure should not be made confidential as was done by the OGA in responding to the CPRE FOIA and EIR enquiry when it refused disclosure of the “Well Completion” and the “Extended Well Test” applications in the following terms:
 11. Section 43(2) FOIA provides that information is exempt from disclosure if disclosure would, or would be likely to prejudice the commercial interests of any person (including the public authority holding it). Regulation 12(5)(e) EIRs provides that a public authority may refuse to disclose information to the extent the confidentiality of commercial or industrial information where such confidentiality is provided by law to protect a legitimate economic interest.
 12. The OGA is withholding information in respect of technical details provided by third parties to Cuadrilla (for example casing shoe, well bore, rig and pump types, depths drilled, number of stages and injection rates). One of the functions of the OGA is to regulate the oil and gas industry. In exercising its regulatory functions, the OGA considers the technical details of the operations to be carried out by the licensees, operators and their partners.
 13. Disclosure of these technical details, would, or would be likely to, provide competitors of Cuadrilla and their partners with technical information (in some cases of a specific and unique nature), which is likely to undermine their commercial positions (for example by such competitors copying technology for free or by forcing them to pay more for the goods and services that they will know that they need by the release of the information). All of this is likely to have negative repercussions for Cuadrilla and its partners in a competitive environment.

We will present evidence that commercial confidentiality is preventing effective regulation of the onshore exploration for petroleum products.

9. For the most part, it is common practice for a licensee/developer to rely on subcontractors to carry out even the basic procedures necessary to construct and exploit a wellpad to explore for petroleum products. For the purposes of this referral, we list just some of the special services that would customarily be supplied by subcontractors: performance of a 3D microseismic survey of the area of interest prior to the development of the wellpad, analysis of the survey data to determine the geology of the area of interest (i.e. determination of the boundaries of the various formations and the locations of faults), drilling of the vertical and lateral boreholes, perforation of a borehole prior to hydraulic

fracturing, real-time 3D microseismic measurements (and their interpretation) made during and possibly after hydraulic fracturing.

10. The HFP sets out in some detail how hydraulic fracturing is to be carried out in a way that ensures that the hydraulic fracture fluid does not penetrate beyond the target formation(s) nor into any of the known faults (please see Section q of the HFP, Appendix 3). The following extract from the Environment Agency's EPR Compliance Assessment Report (ID UP3431VF/0309861) denotes that the HFP is fit for purpose:

The key elements of the plan are:

Microseismic monitoring

We consider that the proposals for microseismic monitoring are proportionate to the planned operations and adequate measures are in place for the protection of groundwater.

Fault reactivation

This is fundamental to understanding whether existing faults could be reactivated by the fracturing process, and therefore create a pathway beyond the permit boundary into groundwater bearing strata above. The fault reactivation assessment concluded that the risk of faults reactivating is mitigated by the staged control of the injections and by seismic monitoring.

Mitigation Measures

We note the commitments in section 5.0 p) of the HFP to assess and review the injection rates and pressures and to adjust the injection program in the event that the monitoring data indicates fractures or fault interactions with preferential flow pathways towards the edge of the permitted boundary.

There is every reason to believe that, had the HFP been adhered to, exploration for shale gas at PNR would have proceeded smoothly.

11. In the event, however, the red threshold of the Traffic Light System (TLS) has been surpassed on several occasions. The most serious surface tremor, which registered a TLS response of 1.5 ML, occurred on 11 December; this tremor, and an earlier one registering 1.1 ML, were sufficiently intense to be felt by local residents. Francis Egan, CEO of Cuadrilla has stated that exploratory hydraulic fracturing would not be commercially viable unless the red TLS threshold is raised.
12. However, the Shale Environment Regulator Group (comprising the Environment Agency, the Health and Safety Executive and the OGA), in a series of updates has emphasized that the surface tremors are too weak to cause harm and the tremors at depth are consistent with the HFP. In an announcement on 13 December, the OGA was similarly reassuring; it stated

“Following any event that exceeds the [red] threshold [of the TLS], the operator is required to immediately pause, reduce pressure and monitor for any further events.

“During these pauses, the OGA compares the location, magnitude and ground motion of these minor seismic events to the operator’s approved Hydraulic Fracture Plan (HFP).

“To date the OGA has been satisfied that these events have been in line with the geological understanding set out in the HFP and that the risk of induced seismicity is being appropriately managed.”

However, we regard these assurances as unjustified because, at the time they were given, the seismic data had not been disclosed even to the OGA on the grounds of commercial confidentiality. Further, no attempt has been made to explain why these seismic events have occurred, nor to address the potential for harm to the borehole at depth where the energy responsible for the events has been released. We regard these omissions as indicative of an unacceptable lack of candour and independence by the OGA, especially given that in 2011 a TLS event of local magnitude 2.3 M_L at Cuadrilla’s Preese Hall vertical well was sufficient to ovalise 160 feet of the borehole at a depth of about 8500 feet and to cause the well to be abandoned.

It is our understanding the seismic data have since been disclosed to the OGA which has made them available to independent groups for more detailed and hopefully more expert analysis than they have received to date.

13. The sound understanding of the geology of the relevant formation(s) is essential to the successful implementation of the HFP and it is a major failure that this is not been achieved for the PNR site. There are unaccountable differences between the various geologies which have been reported for the site, the latest and most serious being that the Millstone Grit formation does not extend all the way over the Upper Bowland Shale formation so the vertical well enters directly into that formation and passes through a major fault and some lesser but still significant faults. This renders the integrity of the well highly vulnerable in the event of movement of the fault(s). Had the HFP been adhered to, such a potentially dangerous configuration could not have occurred and, that it has, represents a major failure of the OGA’s regulatory function and casts doubt on the safety of operations at PNR.
14. There have been other comparable gross failures of regulation, e.g. IGas, when exploring for shale gas at the Tinker Lane site (near Blyth, North Nottinghamshire) failed to find the target Bowland Shale formation, and Egdon Resources, when exploring for oil by drilling the Biscathorpe-2 well (near Louth, Lincolnshire), failed to find the target Basal Westphalian Sandstone formation.
15. All the concerns in this section were expressed in our request for the internal review, but the response was merely an acknowledgement that they had been expressed. We regret that the OGA made no attempt to consider that our

concerns related to the issue of commercial confidentiality and how it impinged on OGA's role as a regulator of hydraulic fracturing.

16. CPRE believes that safety and efficiency require all operational details should be in the public domain and that technological advances made by contractors should be protected by patent rather than reliance on commercial confidentiality. We earnestly seek the support of the ICO by adjudicating in favour of this view.

With my thanks for your consideration of this matter.

Yours sincerely,



Jackie Copley MRTPI MA BA(Hons) PgCERT
Planning Manager

Copied by e-mail attachment to OGA at foirequests@ogauthority.co.uk

Patron

Her Majesty the Queen

President

Emma Bridgewater

Chairman

Nick Thompson

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Registered number: 5291461

Registered charity number: 1107376

Appendix 1



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21 December 2018

By e-mail

*working locally and
nationally for a beautiful
and living countryside*

FOI Manager,
Oil and Gas
Authority,
21
Bloomsbur
y Street,
London,
WC1B 3HF.

Dear FOI Manager,

FOI-2018-0055

I am writing on behalf of the Lancashire Branch of the Campaign to Protect Rural England to express dissatisfaction with the way the OGA has handled this FOIA enquiry. The reasons for our dissatisfaction are as follows:

1. On 27 September 2018, I wrote to the OGA in the following terms

"I am writing on behalf of the Lancashire Branch of the Campaign to Protect Rural England to you with a Freedom of Information Act enquiry.

"I request that you arrange to have disclosed to me the OGA-approved Hydraulic Fracture Plan for PNR1Z well at the Preston New Road site as described in plans put forward by Cuadrilla Bowland Limited [Cuadrilla] and announced by the OGA on 24 September 2018.

"I would also appreciate you disclosing to me the recently OGA-approved well completion proposal for the PNR1Z well, including hydraulic fracturing [HF] operations, and the three-year extended well test."

Appendix 1 (cont'd)

2. Twenty working days later, on 25 October, the OGA replied stating that it would require a further twenty days for it to respond. In justification, the OGA cited Regulation 7 of the FOIA which entitled it to do so because it had reason to believe the complexity and volume of the information requested meant that it was impractical to comply with our request within twenty days. By way of information, in the same communication, the OGA also mentioned that, under the terms of the FOIA, it was entitled to extend the period of time when it is necessary to consider a test of the public interest.
3. In reply, I wrote to the OGA on 31 October, emphasising that the documents we sought already existed in convenient digital form and were currently the basis of the OGA's regulation of the operations already being carried out by Cuadrilla at its Preston New Road site; we sought a rational explanation of why the documents could not be disclosed forthwith, given that no time or effort was required to carry out searches in order to assemble the information we sought.
4. In response, in the OGA e-mail of 2 November, it was stated that a time extension was necessary because "a further test of the public interest was required"; no reference was made of the need to invoke Regulation 7 which had been given in the OGA e-mail of 25 October. In our e-mail of 6 November, we expressed our dissatisfaction that the need for a test of the public interest had been elevated from a matter of information to the sole reason for the need of the 20-day time extension. That dissatisfaction is an important element of this complaint.
5. Further, in the OGA e-mail of 2 November, a link was provided to Cuadrilla's website where Cuadrilla's HFP was available. The document was version 9, and had been signed off by Cuadrilla's Senior Geoscientist on 27 June 2018; we had supposed that this document had been submitted to the OGA for approval (at least one other HFP had earlier been published on Cuadrilla's website). In our e-mail of 6 November, we sought confirmation that the HFP on Cuadrilla's website was the OGA-approved document, or, should it not be, that the approved document should be immediately disclosed to me. We make further critical comments on this situation below.
6. Additionally, we ask it to be noted that OGA could have made reference to the HFP on the Cuadrilla website in its e-mail to me of 27 September and we regard it as symptomatic of OGA's unhelpful attitude that it did not do so. We are also unhappy that it has not been possible to correspond about this matter with a named member of OGA staff.
7. The remainder of this complaint relates to the OGA response to our FOIA enquiry of 27 September as delivered to me by e-mail on 22 November (i.e. 40 days after the date of my enquiry).
8. Paragraphs 3 and 4 of the OGA response make it evident that the Cuadrilla HFP on its website has OGA approval, but this information should have been made available to me much more directly and much earlier, especially given the confirmations I sought (please see paragraph 5 of this document).

Appendix 1 (cont'd)

9. We regard to the withholding of the Well Completion and Extended Well Test applications (OGA response paragraph 5) on the ground of commercial confidentiality as unacceptable.
10. In our view, Cuadrilla should be responsible for the actions and omissions of its contractors and the terms of engagement of contactors should make that clear. Thus, any data supplied by a contractor, and the results of analysis of those data, should be the property of Cuadrilla and not capable of being embargoed in the commercial interest of the contractor (reference paragraph 7 of the OGA response).
11. We do not believe that the responsibility we wish to see imposed on Cuadrilla would be harmful to its commercial interests. Our understanding is that the only commercially competitive process in this enterprise occurred in the bidding process for the PEDL and, provided it is diligent in its endeavors to exploit the licence, Cuadrilla is not vulnerable to competitive pressure.
12. Cuadrilla's HF activities at its Preston New Road site have encountered unanticipated difficulties. The red threshold of the Traffic Light System (TLS) has been surpassed on several occasions, the most serious surface tremor occurring on 11 December registered a TLS reponse of 1.5 ML; this tremor and an earlier one registering 1.1 ML were sufficiently intense to be felt. Francis Egan, CEO of Cuadrilla has stated that exploratory HF would not be commercially viable unless the red TLS threshold was raised.
13. However, the Shale Environment Regulator Group (comprising the Environment Agency, the Health and Safety Executive and the OGA), in a series of updates has emphasized that the surface tremors are too weak to cause harm and the tremors at depth are consistent with the HFP. In an announcement on 13 December, the OGA was similarly reassuring; it stated

"Following any event that exceeds the [red] threshold [of the TLS], the operator is required to immediately pause, reduce pressure and monitor for any further events.

"During these pauses, the OGA compares the location, magnitude and ground motion of these minor seismic events to the operator's approved Hydraulic Fracture Plan (HFP).

"To date the OGA has been satisfied that these events have been in line with the geological understanding set out in the HFP and that the risk of induced seismicity is being appropriately managed."

However, we regard these assurances as complacent because they do not specifically address the cause of these unexpectedly large tremors and the possibility of damage to the well by the energy released at depth.

14. It is not possible to go into full technical detail in this context. It must suffice to highlight reasons why closer scrutiny is necessary

Appendix 1 (cont'd)

- The latest reported geology shows that the Millstone Grit formation does not extend over the Upper Bowland Shale formation as far as where the vertical well enters that formation, whereas earlier reported geologies show the vertical well passing through approximately 400 m of Millstone Grit formation before reaching the Upper Bowland Shale formation. There are also other unaccountable differences between the various reported geologies.
- The vertical well passes through a major fault and some lesser but still significant faults in the Upper Bowland Shale formation. This renders the integrity of the well highly vulnerable in the event of movement of the fault(s). Such a configuration should have been avoided.
- The HFP (see for example Section q, *Permit Boundary / Microseismic Monitoring*, page 1) provides for monitoring of the penetration of HF fluid in real-time during the HF process, so that known faults could be avoided (the HF process would be stopped in the event of the HF front approaching a fault or a boundary of the target formation, taking account of the resolution/uncertainty of the monitoring technology). That there have been an unexpected number of surface earth tremors detected sufficient to give a red TLS response, appears to indicate that the real-time monitoring of the penetration of the HF fluid has not been working properly, or that there are several significant faults (some possibly highly stressed) which have not been detected and which are inadvertently being penetrated by HF fluid either during the HF process or sometime later.
- The fact that the well is found to be gas tight after one of these seismic events does not mean it is undamaged, only that any damage does not extend the entire length of the cement casing surrounding the steel well tube.

For these reasons, we believe it essential that the data associated with the Well Completion and Extended Well Test applications should be in the public domain so it is available for scrutiny by interested parties.

15. To elaborate on the last point, it is our understanding that all the seismic data have not been disclosed (on the ground of commercial confidentiality) to the Environment Agency, the British Geological Survey, or the specialist groups at Liverpool, Durham and Newcastle Universities or even to the OGA, so these data could benefit from more detailed and hopefully more expert analysis than they have been subjected to by Cuadrilla.
16. We believe it is important that shale gas developers share their experience in the field; it would make their operations more efficient and safer. In our opinion, the OGA's decision to suppress disclosure of the information we seek on the ground of commercial confidentiality is against the mutual interests of the developers and the interest of the nation.
17. We therefore ask you to reconsider your decision to refuse disclosure of much of the information which is the subject of our FOIA enquiry. Should you confirm

your decision, I give notice we shall apply to the Information Commissioner to adjudicate on the issue.

With my thanks in anticipation of your further consideration of this matter,

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'Jackie Copley', written in a cursive style.

Jackie Copley, MRTPI, MA, BA (Hons), PgCert
Planning Manager

Appendix 2



21 Bloomsbury Street
London WC1B 3HF

Jackie Copley MRTPI MA BA(Hons) PgCert

By email to: jackie.copley@cprelancashire.org.uk

Ref No: FOI-2018-0055

19 February 2019

Dear Ms Copley,

INTERNAL REVIEW OF FREEDOM OF INFORMATION REQUEST FOI-2018-0055

A Background

1. I am writing in response to your request for an internal review of the above case, dated **21 December 2018**.
2. I have now reviewed the Oil and Gas Authority's ('OGA') response to your original request (**the 'Response'**), dated **22 November 2018**. A copy of the Response is attached to this letter at **Annex [B]**.
3. In your original request of **27 September 2018** (the '**Original Request**') you asked for a copy of the OGA-approved Hydraulic Fracture plan for the PNR site and the OGA approved well completion proposal for the PNR1Z well and the three-year Extended Well test. A copy of this request is at **Annex [A]**.
4. The OGA responded by:
 1. sending a copy of the completion application (with personal information redacted under *section 40(2) FOI / 13(1) EIR*),
 2. a link to Cuadrilla's HFL; and,
 3. withholding the rest of the requested information (i.e. withholding the Well Completion application and the Extended Well Test application) under *sections 43(2) and 41(1)* of the Freedom of Information Act 2000 ('FOIA') and, where relevant, under *Regulations 12(5)(e)*, of the Environmental Information Regulations 2004 ('EIRs') (*commercial confidentiality*).

OGA Internal Review by Hedvig Ljungerud, Director of Strategy

Appendix 2 (cont'd)

5. On **21 December 2018**, you requested an internal review into the way your request was handled.
6. In your request for an internal review, you raised the length of time taken to answer the original request; that the Hydraulic Fracture Plan being in the public domain had not been communicated to you in advance of the main answer; and finally challenged the OGA withholding the well completion and the three-year Extended Well test applications, on the grounds that the exemptions applied under commercial confidentiality were not valid. A copy of your request for an internal review is at **Annex [C]**.

B Review

7. Firstly, on the substantive matter of disclosure: I have further considered the withheld information and the potential harm that a release could cause, and have also further consulted Cuadrilla. While the OGA will take third party views into account, it remains the OGA's decision whether to disclose information or not under FOI/EIR.
8. The OGA maintains that these documents were sensitive and consequently should not have been disclosed at the time of your request. I am satisfied that the arguments made at the time of the initial response, as to why the exemptions used were valid, were reasonable at that time.
9. However, I have concluded on balance that - due to the passage of time and some of the public announcements that Cuadrilla have made since the original request - the disclosure of the Well Completion and Extended Well Test applications are no longer likely to cause a sufficient level of harm to justify continuing to withhold them.
10. Therefore, please find attached the Well Completion application and Extended Well Test application provided by Cuadrilla at **Annex [D]**.
11. Regarding procedural matters, I note your dissatisfaction with the OGA's reliance on a test of the public interest in order to extend the deadline for response in addition to complexity and volume, and only quoting the public interest in follow-up communications. While not explicitly re stated in each follow-up communication, both reasons for extension applied. The general provisions of a test of the public interest under both regimes, FOI and EIR, are the same or substantially similar.
12. I note your point that the OGA did not communicate earlier that the version of the Cuadrilla HFP on its website had OGA approval. It is best practise for the answer to be made to the entire request at the same time rather than fragmented/piecemeal responses.
13. On the matter of communication with a named individual, this is standard approach for staff of the relevant job grade for Data Protection reasons.
14. Aside from noting these three important procedural matters, I note that your request for an internal review makes a number of other statements. The absence of the OGA addressing all these points does not indicate that the OGA agrees with them.

Appendix 2 (cont'd)

C. Summary

15. Consequently, in consideration of the above, I conclude that:
 - a) Withholding the entire Well Completion and Extended Well Test applications was appropriate at the time of the original FOI request and the reliance on the exemptions/exceptions under *section 41(1), 43 (2) FOIA* and *Regulations 12(5)(e) and (f) EIR*, was reasonable at that time.
 - b) These documents are no longer commercially confidential, due to the passage of time and subsequent public communications by Cuadrilla, and should now be disclosed in full.
16. This concludes my review of the handling of your request.
17. If you are unhappy with the outcome of this internal review, you may contact the Information Commissioner for a decision. The Information Commissioner can be contacted at: Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF

Yours sincerely,

[Signed]

Hedvig Ljungerud Director of
Strategy OGA

Appendix 3

Extract from the OGA-approved HFP:

q Permit Boundary / Microseismic Monitoring

An evolutionary process as described in the PNR ES [Preston New Road Environmental Statement] Chapter 12 will be employed to understand the performance of the reservoir during fracturing. This stepped progressive approach to hydraulic fracturing will consist of an initial mini-fracture stage and modest initial pumped volumes building up to a maximum pump volume of 765 m³ per stage. As this process continues, an understanding of the performance of the reservoir during hydraulic fracturing is developed by monitoring the extent of fracture growth using a real-time downhole microseismic array.

If, during hydraulic fracturing, monitoring data indicate possible fracture growth with a preferential flow pathway towards the edge of the permitted boundary, the pumping of fracturing fluid would be adjusted or terminated and the injection programme would be adjusted as necessary to prevent future occurrences. If fracture fluid is interpreted to be outside of the permitted boundary injection will stop after flushing the well. If significant microseismicity continues to occur after the end of injection, then real-time monitoring will continue until it is clear that fractures are not extending beyond the permitted boundary. Future injection operations will be altered to comply with the permitted boundary by adjusting fluid volume, rate, pressure, and or injection point.

The operational boundary is greater than the red line boundary as outlined within the Permit EPRAB3101MW. The purpose of the operational boundary is to provide a limit of detection for seismic events which can be detected to a high degree of certainty. If significant events or cluster of seismic events occur outside the Permit boundary they will be detectable by Cuadrilla's monitoring inside the operational boundary. Any seismic events occurring outside of the operational boundary will be assumed to have a natural provenance except where there is a clear geomechanical link to faults, fractures or seismic event clusters within the operational boundary. The use of microseismic monitoring will track fracture height growth and length to monitor any relationship with seismicity outside the permitted boundary.