



APPENDIX 4.2: SPECTRUM REPORT



Noise Impact Appraisal Testing of Balcombe-2z Oil Well Lower Stumble Exploration Site

Report ref.

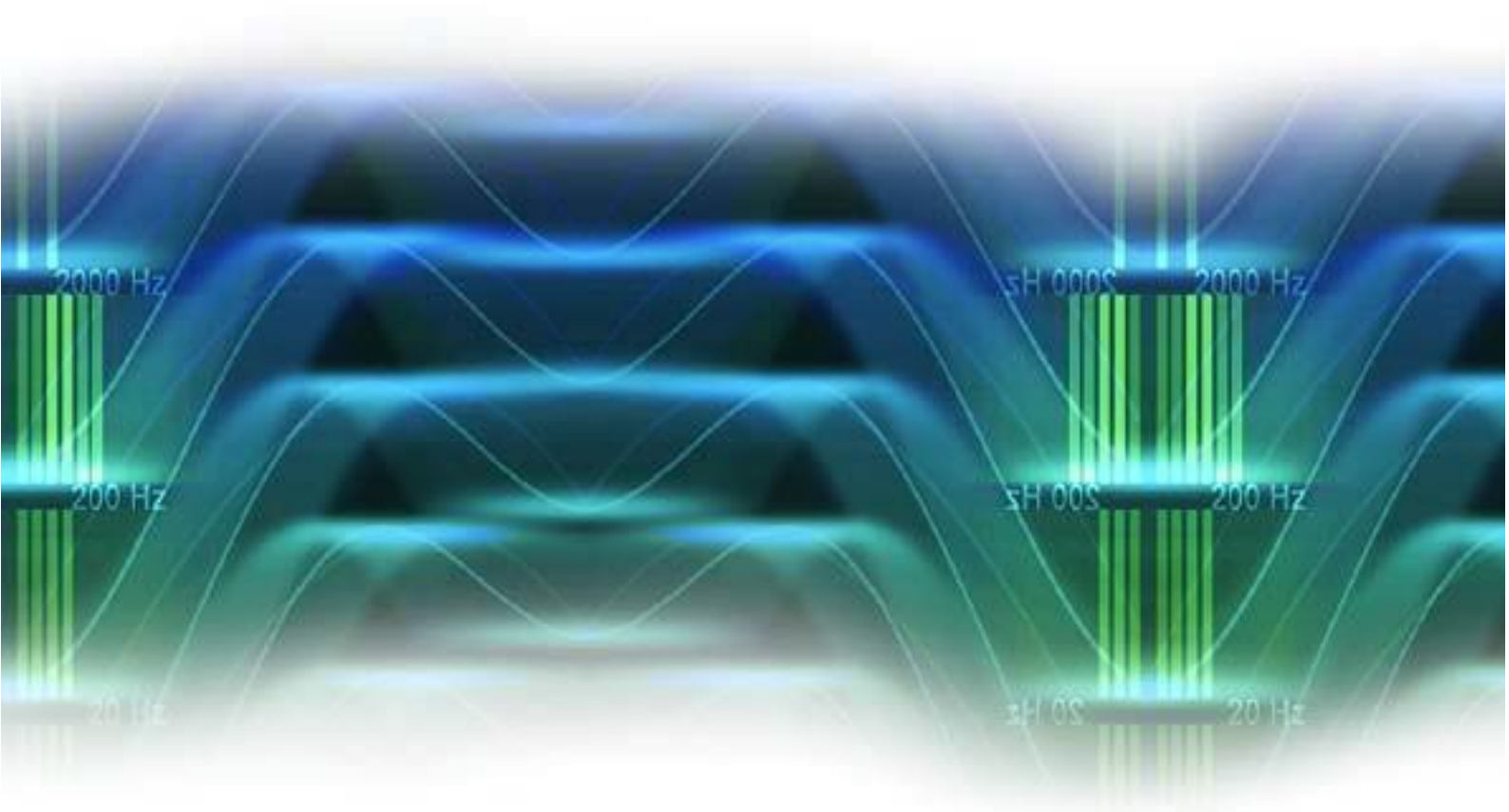
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1. INTRODUCTION

Cuadrilla Resources Limited is planning to complete testing operations at their Balcombe–2z oil well, located at the Lower Stumble exploration site, in Balcombe West Sussex.

Testing (in outline terms) would comprise the following operations:

- Pre-test operations: Involving mobilisation and operation of the work-over (service) rig, to tube, clean out and prepare the borehole.
- Well test operations Involving opening the well and use of a bean pump (nodding donkey pump) to extract and test the flow of oil, water and gas

In terms of plant and equipment requirements, testing operations are significantly less intensive than preceding drilling operations and consequently the expectation would be that such testing operations, would comply with the same noise limits as imposed on the drilling operations at the well site, as previously consented by the planning authority.

To provide additional information to inform the planning application for the testing operations this report provides an appraisal of the potential noise impacts. A quantitative prediction is provided, based on typical noise emission data for the equipment to be used during both pre-test and well test operations. Target noise limits are established, based on relevant standards and guidelines and an assessment is made as to whether or not such targets would be met.

2. ASSESSMENT METHODOLOGY

2.1 NOISE FROM MINERALS EXTRACTION OPERATIONS

The National Planning Policy Framework (NPPF) 2012 provides guidance to Local Planning Authorities, with respect to determining planning applications covering minerals extraction. The noise limits advised in technical guidance notes 30 and 31 of NPPF may be summarised as follows

First aim: Background noise level (LA90) + 10dB(A), for all periods.

However, in the cases where this noise limit restriction imposes an unreasonable burden on operations, the following limits to be applied:

Daytime 0700-1900: Increase over background LA90 to be as near to + 10dB(A) as is practicable, subject to an upper limit of 55dB(A) LAeq(1 hour) free-field.

Evening 1900-2200: Background LA90 + 10dB(A).

Night time 2200-0700: 42dB(A) LAeq(1 hour) free-field.

Additionally, for periods of up to 8 weeks in a year at specified noise-sensitive properties an increased temporary daytime noise limits of up to 70dB(A) LAeq 1 hour (free field) can be considered to facilitate essential works such as site preparation and restoration.



For the proposed temporary testing operations noise levels will be assessed against noise limits based on the advised absolute noise limits of 55dB(A) daytime and 42dB(A) night time. These limits are in line with those specified in the planning consent covering the preceding drilling operations at the site.

2.2 ROAD TRAFFIC NOISE

Procedures assessing road traffic noise impacts are described the Highways Agency advice note 'Design Manual for Roads and Bridges' (DMRB) volume 11, section 3 part 7: Noise & Vibration (August 2008). This document provides guidance on the appropriate level of assessment to be used when considering the noise and vibration impacts arising from new and improved road projects. Whilst the detailed guidance contained in this document is aimed at assessing both stepped and future changes to traffic noise from new roads and road alterations, the procedure does include the screening and scoping phases that may be applied to other projects, which are likely to produce much less significant changes.

The screening process involves identification of whether change in traffic noise is likely to be significant, with the significance indicator being an increase to existing traffic of 25%, or greater. This change in traffic volume corresponds to a change in noise level of +1dB(A), which represents the smallest increment in noise increase that is regarded as being discernible, in terms of a short term change.

For projects, other than new or altered road schemes, the produced increase to traffic volume is unlikely to reach 25%. Where this is identified in the screening study the guidance suggests that no further assessment is normally required.

For the testing operations, traffic requirements have been forecast as a requirement for 11 additional cars (22 movements) and 1-2 HGV's (3 movements). Such minimal additional traffic would present only a small percentage increase to existing traffic, greatly below the 25% required to be significant in terms of noise. Traffic noise impact has therefore been screened out of a more detailed quantitative assessment.

3. POTENTIAL NOISE IMPACTS

For the planned testing operations at the exploration well site the following temporary noise impacts have been identified for assessment:

- Noise produced during pre-test operations
- Noise produced during well testing operations
- Traffic to the site during testing operations

In order to assess the level of potential noise impact a quantitative prediction for the pre-testing and testing operations is provided. With planned traffic movements to the site being at a very low level, this impact is not included in the scope of a qualitative assessment (as explained in section 2.2).



3.1 SENSITIVE RECEPTOR

For the purpose of defining noise impact, noise level predictions have been made at the closest and therefore most sensitive residential receptor position to the exploration site, at position R1 (Kemps Farm) located 380m north of the site. Figure 1 illustrates the relative positions of the well site and the residential receptor position.

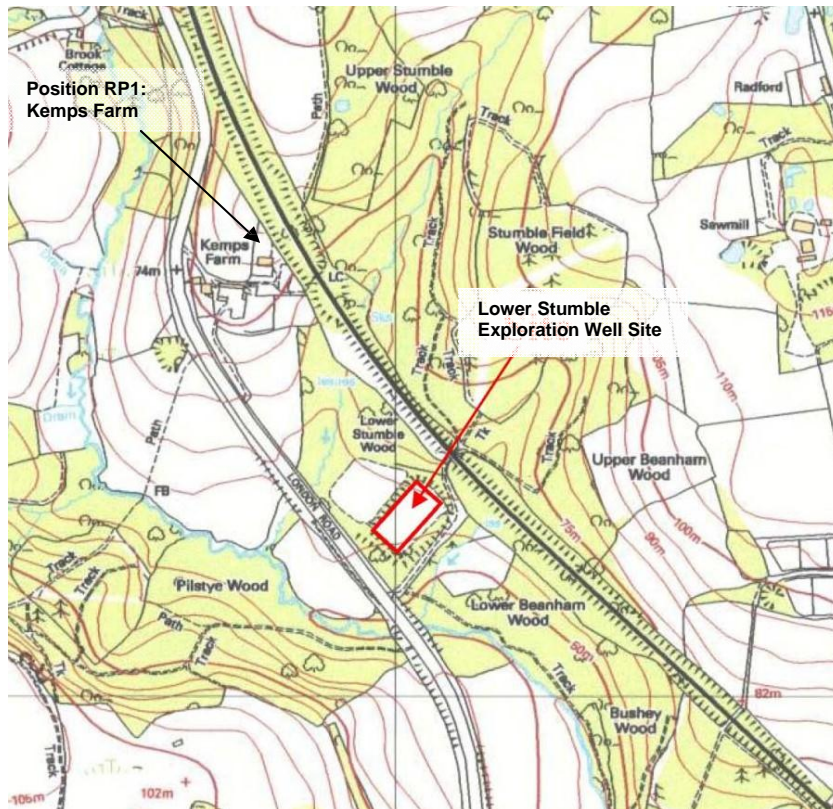


Figure 1: Plan showing Lower Stumble Exploration Well Site and closest residential position RP1.

3.2 PREDICTION METHODOLOGY

To provide an appraisal of the potential impact of testing, in terms of demonstrating compliance with the NPPF advised noise limits, noise level predictions have been made, based on the typical noise levels produced by these operations, using the identified plant items.

Predictions have been made in accordance with guidelines and procedures contained in BS5228-1:2009 'Noise and Vibration Control on Construction and Open Sites. Part 1: Noise'. The procedure involves identifying the main items of plant and equipment and then assigning a sound power level, based on equipment noise data included in an appendix of the Standard, or, as in this case, from available test information on similar plant used on other well sites operations.



Predictions of community noise levels are made by applying corrections to the sound power of each equipment source, to account for the following operational and environmental factors: -

- Typical periods of operation of plant
- Separating distances from source to receiver
- Presence of natural land topography screening or artificial barriers.

3.3 NOISE PRODUCED DURING PRE-TEST OPERATIONS.

The pre-test operations would involve use of a work-over rig, to run in tubing and clean out and prepare the borehole, for the subsequent testing. A generator set would also be used for site power.

Sound power data for the work-over rig has been taken from noise tests conducted at a well site conducting similar work-over operations. The sound power for the site power generator is taken from table C4 of BS5228-1 being indicative of a small enclosed generator set.

The overall LAeq(1 hour) noise level has been predicted at the closest residential location to the well site, at receptor position R1 (Kemps Farm). The results are summarised in table 1 below.

Plant	Sound Power LWA dB	Adjustments dB(A)		Result Lp dB(A)	On time %	Activity LAeq(1hr) dB
		Dist.	Screening			
Work-over rig	102	-60	-5	37	100	37
Site generator	90	-60	-5	25	100	25
Total Plant						37

Table 1: Predicted noise levels from pre-test operations at position R1 (Kemps Farm)

The prediction includes for a -5dB(A) correction to account for the natural screening provided by the land topography and the intervening copse areas, which occlude the direct line of sight between the well site and the house position. The total -65dB(A) noise loss between the well site and the house position has been verified by measurements taken during the recent drilling operations.

The prediction indicates that the pre-test operations would typically produce an LAeq(1 hour) contribution of 37dB(A) at the nearest (most sensitive) residential position.

3.4 NOISE PRODUCED DURING TESTING OPERATIONS

The testing operations would involve operation of the bean pump (nodding donkey), with a small generator set also required for provision of site power. Other equipment such as tanks and separators would provide low noise emission and are therefore not considered.



Depending on the outcome of the testing, there may be a requirement for burning off produced gas, commonly referred to as flaring. Noise produced by flaring is variable, being depending on gas flow rates to the burner and can vary between barely perceptible (with very low gas flows), to a more significant level with high gas flow rates. Should higher gas flows prevail, noise emission can be controlled by enclosing the flare, throttling back the flow during the sensitive night time period, or a combination of both. As the flare noise is unpredictable, but is controllable at source, the potential contribution from this source has not been included in the prediction.

Sound power data for the bean pump (nodding donkey) has been taken from noise tests conducted at an operating well site where this equipment is continuously operated. The sound power for the site power generator is taken from table C4 of BS5228-1 being indicative of a small enclosed generator set.

The overall LAeq(1 hour) noise level has been predicted at the closest residential location to the exploration site, at receptor position R1 (Kemps Farm). The results are summarised in table 2 below.

Plant	Sound Power LWA dB	Adjustments dB(A)		Result	On time	Activity LAeq(1hr) dB
		Dist.	Screening	Lp dB(A)	%	
Bean pump	95	-60	-5	30	100	30
Site generator	90	-60	-5	25	100	25
Total Plant						31

Table 2: Predicted noise levels from testing operations at position R1 (Kemps Farm)

The prediction again includes for a -5dB(A) correction to account for the natural screening provided by the land topography and copse. The prediction indicates that the testing operations would typically produce an LAeq(1 hour) contribution of 31dB(A) at the nearest residential position.

4. MITIGATION

Noise emission during testing operations would be produced by operation of the work-over rig, the bean pump, together with associated plant, including generators. All such plant includes standard mitigation to reduce noise by incorporating high performance acoustic enclosures and silencers into the design.

The proposal is to complete a continuous noise monitoring survey at the Kemps Farm receptor position throughout the pre-test and testing operations, in order to verify that the defined noise limits are being met on a continuous basis. Should noise limits be exceeded additional noise mitigation would be implemented to reduce noise to the acceptable levels.

5. ASSESSMENT OF NOISE IMPACT

5.1 NOISE FROM PRE-TEST OPERATIONS

There are not expected to be significant tonal, or impulsive, characteristics to the predicted noise from the equipment used for pre-test operations. The rating level, as defined in BS4142, would therefore numerically be the same as the predicted specific LAeq noise level contribution from these operations.



The pre-test operations would be conducted during normal daytime working hours (0700-1900) when the applicable noise limit (in line with NPPF guidance notes) would be 55dB(A). The predictions have demonstrated that at the nearest sensitive residential position to the well site, noise produced by the pre-test operations would be well below this daytime limit. In further consideration of the fact that the pre-test operations would be short term, the indication is that there would be a low adverse impact from the aspect of noise and the overall effect of these operations would not be significant.

5.2 NOISE FROM TESTING OPERATIONS

Again, there are not expected to be significant tonal, or impulsive, characteristics to the predicted noise from the equipment used for pre-test operations. The rating level, as defined in BS4142, would therefore numerically be the same as the predicted specific LAeq noise level contribution from these operations.

The testing operations would be continuous, extending through the night time period (2200-0700), when the applicable noise limit (in line with NPPF guidance notes) would be 42dB(A). Predictions have demonstrated that at the nearest sensitive residential position to the site, noise produced by the testing operations would be well below this night time limit. In further consideration of the fact that the testing operations would be short term, the indication is that there would be a low adverse impact from the aspect of noise and the overall effect of these operations would not be significant.

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