

**WHITECLEAVE QUARRY
NOISE IMPACT ASSESSMENT**

**BUCKFASTLEIGH
DEVON**

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1. INTRODUCTION

1.1. Background

- 1.1.1. Whitecleave Quarry is located on the Eastern side of the A38 within Buckfastleigh, Devon. Site access is from the B3380 (Plymouth Road) going under the A38. The quarry in relation to its surroundings is shown in the aerial photograph in Figure 1.1 below.



Figure 1.1.1 Aerial Photograph of site

- 1.1.2. There has been evidence of mineral extraction occurring at the quarry since the 1950's, but the site had not been worked for a number of years. Quarry operations recommenced in 2014.
- 1.1.3. Planning permission for the quarry was reviewed and brought into line with the requirements of the Environmental Act 1995. Under this new legislation, working conditions were agreed. The planning condition relating to Noise is:

“ 9. Noise emitted from the Mineral Site shall not exceed 55dB (LAeq) (one Hour) freefield between 0700 and 1900 hours Mondays to Fridays and 0800 and 1300 hours on Saturdays and shall not exceed 45dB (LAeq) (one hour) at any other time as measured at any occupied residential building not in the control of the operator.

Noise Limits may exceed these limits between the hours of 0900 and 1700 Monday to Friday inclusive for temporary periods during bund construction, soil stripping, removal of spoil heaps and the construction of new permanent landforms with the prior agreement in writing of the Mineral Planning Authority.

Reason : *To protect the amenities of the local area."*

1.1.4. LAeq is the equivalent continuous sound level. This is the level of a notional steady sound which, at a given position and over a defined period of time, would have the same A weighted acoustic energy as the fluctuating sound that occurs over the same period.

1.1.5. The current planning conditions were put in place when the site undertook extraction via blasting, with the rock then crushed on site. The current operations involve removal of the rock using a hydraulic hammer and then crushing the rock.

1.2. Assessment Purpose

1.2.1. The purpose of the assessment is to determine the current noise levels emitted from the Quarry site during the use of excavation equipment.

1.2.2. The assessment has recorded noise levels at nearby residences and distinguished between the specific site noise level and the general ambient background levels recorded in the same locations. Measurements have been taken at the facades of the properties and suitable corrections for any façade effect have been taken into consideration.

2. LEGISLATIVE GUIDANCE

2.1. BS 4142, Methods for rating and assessing industrial and commercial sound.

2.1.1. This British Standard describes methods for determining, at the outside of a building:

- a) Noise levels from factories, or industrial premises, or fixed installations, or sources of an industrial nature in commercial premises; and
- b) Background noise level.

2.1.2. The assessment periods in BS 4142 use 1 hour during the daytime (07:00 to 23:00) and 5 minutes during the night-time (23:00 to 07:00).

2.1.3. It is worth noting that the BS allows for the assessment of a rating level by the inclusion of a feature correction. Certain acoustic features can increase the likelihood of complaint over that expected from a simple comparison between the specific noise level and the background noise level. Where present at the background location, such features are taken into account by adding 5dB to the specific noise level to obtain the rating

level. This correction is used if there are any distinguishable characteristics to the noise source such as impulses (bangs, thumps, clicks and clatters), continuous notes (whistles, hiss, screech and hums) or irregularity in the noise to cause it to attract attention.

- 2.1.4. For this report, the 5dB feature correction has not been included as the report is to compare the specific site noise levels with the LAeq limit set out in the planning conditions.

3. METHODOLOGY FOR NOISE MEASUREMENTS

3.1. Initial Measurements

- 3.1.1. Initial measurements were set up within Fullaford Park in Buckfastleigh, this location related to the correspondence received by the planning team with regards to the site noise.
- 3.1.2. Fullaford Park is approximately 500m away from the current excavation works within the quarry and, due to the ground contouring in the area it has a clear view of the quarry location.
- 3.1.3. The construction works measurements were taken on Thursday 19th March 2015.
- 3.1.4. Initial measurements showed that whilst the noise from the excavation works was distinguishable compared to general background noise, the noise levels were not high enough to surpass that limitations set out in the planning conditions. Due to the impact of distance attenuation on noise levels, an alternative location, closer to the works was chosen.

3.2. Measurement Set-ups and Locations

- 3.2.1. Secondary measurements were undertaken at 34 Gipsy Lane, Buckfastleigh, TQ110DL.

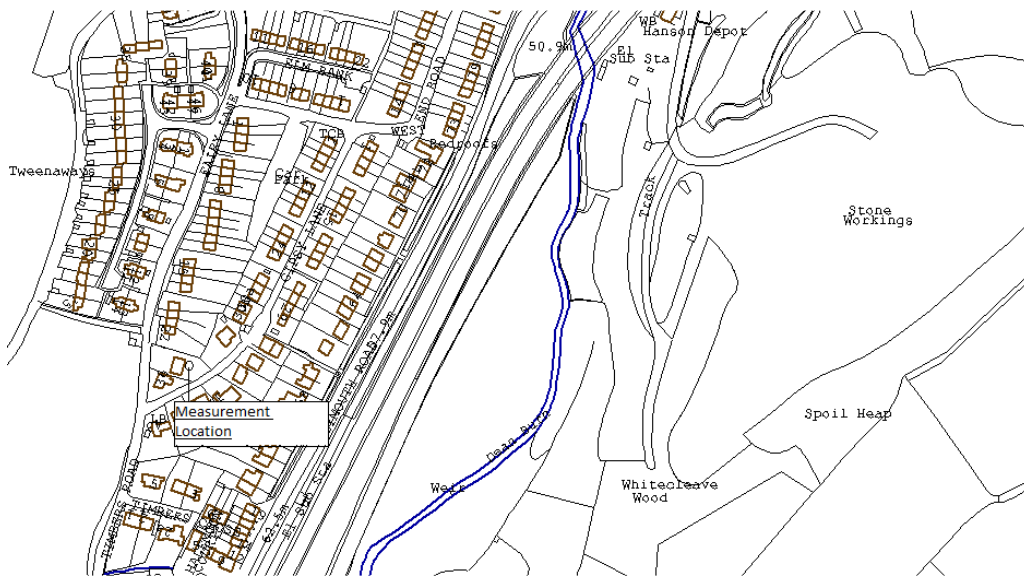


Figure 3.1 Measurement Location

- 3.2.2. These measurements were set up in front of the north-eastern window on the front façade of the property. This façade has a clear view of the quarry location, above any of the intervening properties or the A38. There are several trees surrounding the quarry site but these do little to obscure the view of the works.
- 3.2.3. This location is approximately 300m away from the current excavation works.
- 3.2.4. The measurement equipment used is shown in table 3.1. All equipment complies with BS EN 61672-1:2013 as a class 1 sound level meter.

| Name | Serial Number | Last Calibrated | Calibration Due |
|--|---------------|-----------------|-----------------|
| Brüel & Kjær Type 2250 Light Sound Level Meter | 3003333 | 14/08/2014 | 14/08/2015 |
| Brüel & Kjær Type 4952 Outdoor Microphone | 2821542 | 14/08/2014 | 14/08/2015 |
| Brüel & Kjær Type 4231 Calibrator | 1897756 | 26/03/2014 | 26/03/2015 |

Table 3.1 Measurement Equipment

4. NOISE MEASUREMENT RESULTS

4.1. General

4.1.1. The results for the initial measurements at 9 Fullaford Park have not been included in this report. Brief calculations showed levels below 55dB LAeq 1 hour once corrections have been made for background noise levels and time period corrections.

4.1.2. Four sets of 1 hour measurements were undertaken at 34 Gypsy Lane, the first three measurements occurred on Friday 20th March with the final measurement taken on the 23rd March.

4.2. Results

4.2.1. Table 4.1 shows the results on the 20th March 2015 at 34 Gypsy Lane, these results show measurements for both Background noise levels and the noise level during the use of the Hydraulic Hammer:

| Set No. | Event Name | Start time | Duration | LAFmin [dB] | LAF90 [dB] | LAeq [dB] | LAF10 [dB] | LAFmax [dB] |
|---------|------------------------|------------|----------|-------------|------------|-----------|------------|-------------|
| 1 | Background | 09:15 | 00:12:28 | 49.8 | 54.9 | 57.6 | 59.5 | 64.5 |
| 1 | Hydraulic Hammer | 09:27 | 00:18:00 | 53.6 | 57.6 | 64.7 | 67.9 | 76.9 |
| 1 | Background | 09:45 | 00:29:32 | 51.0 | 54.7 | 57.8 | 59.7 | 73.9 |
| 2 | Background | 10:20 | 00:23:58 | 52.0 | 55.3 | 58.0 | 59.8 | 65.7 |
| 2 | Hydraulic Hammer | 10:44 | 00:16:00 | 52.3 | 57.7 | 64.6 | 67.8 | 75.2 |
| 2 | Background | 11:00 | 00:11:30 | 50.7 | 55.1 | 58.3 | 60.4 | 65.3 |
| 2 | Hydraulic Hammer | 11:11 | 00:08:32 | 53.0 | 57.9 | 65.0 | 67.9 | 74.2 |
| 3 | Background | 11:30 | 00:03:27 | 49.3 | 53.6 | 56.8 | 58.8 | 65.6 |
| 3 | Hydraulic Hammer | 11:33 | 00:09:00 | 54.3 | 57.4 | 63.3 | 66.6 | 74.5 |
| 3 | Background | 11:42 | 00:13:00 | 49.6 | 53.6 | 57.8 | 59.7 | 75.8 |
| 3 | Hydraulic Hammer | 11:55 | 00:14:30 | 52.0 | 58.6 | 65.0 | 67.7 | 74.4 |
| 3 | Site noise - No Hammer | 12:10 | 00:15:00 | 52.9 | 57.4 | 60.6 | 62.5 | 73.4 |
| 3 | Hydraulic Hammer | 12:25 | 00:05:03 | 54.1 | 61.6 | 66.5 | 69.3 | 74.5 |

Table 4.1 Measurement results - 34 Gypsy Lane on the 20th March 2015

- 4.2.2. Table 4.2 shows the results from the 23rd March 2015 at 34 Gipsy Lane, the results contain measurements during the use of an onsite crusher as well as the background levels.

| Set No. | Event Name | Start time | Duration | LAFmin [dB] | LAF90 [dB] | LAeq [dB] | LAF10 [dB] | LAFmax [dB] |
|---------|------------------|------------|----------|-------------|------------|-----------|------------|-------------|
| 4 | Crusher | 14:15 | 00:08:59 | 50.1 | 54.0 | 58.2 | 60.5 | 72.1 |
| 4 | Background | 14:24 | 00:08:00 | 46.4 | 50.7 | 53.2 | 55.1 | 59.0 |
| 4 | Crusher | 14:32 | 00:30:00 | 48.8 | 52.3 | 56.5 | 59.1 | 70.8 |
| 4 | Crusher + Hammer | 15:02 | 00:13:01 | 52.7 | 57.0 | 61.7 | 64.5 | 73.1 |

Table 4.2 Measurement results - 34 Gipsy Lane on the 23rd March 2015

5. NOISE CALCULATIONS

5.1. Façade Correction

- 5.1.1. Due to the location of the measurement, taken 1m from the façade of the property, the readings will show a noise level including reflected noise from the property façade.
- 5.1.2. The planning conditions require a free field level at the property location, therefore a standard correction of -3dB has been applied to all LAeq values to correction for any reflected noise levels.

5.2. Background Noise levels

- 5.2.1. An average LAeq level has been calculated for the readings taken on the 20th March. This average is a logarithmic average of the LAeq background readings taken.
- 5.2.2. Calculated Background noise level is 54.7dB LAeq for the readings on the 20th March.
- 5.2.3. The measurement on the 23rd March only had 1 segment where the site noise was not distinguishable from the general ambient noise in the area and this is set as the background level of 50.2dB LAeq.
- 5.2.4. These calculated background levels can be used to correct the general noise when site works where noticeable to provide a Noise contribution level LAeq for just the site works.

5.3. Time period correction

- 5.3.1. Due to the variability of the excavation work taking place and the use of the Hydraulic Hammer, the excavation noise levels are not constant over the whole hour period.

5.3.2. During the readings, the measurements were marked to show time periods where the hammer was active; these are shown in Table 4.1 as the Event Name “Hydraulic Hammer”.

5.3.3. The planning conditions require that the site noise does not exceed 55dB LAeq 1 hour and therefore any measurements taken must be averaged out over the full 1 hour time period to provide a fair assessment.

5.4. Calculated results

5.4.1. Calculated results for the site noise are shown in table 5.1 for the measurements on the 20th March and table 5.2 for the measurement on the 23rd March.

| Set No. | Start time | Duration | Measured Level LAeq [dB] | Façade Correction | Corrected LAeq [dB] | Background Level LAeq [dB] | Noise Contribution LAeq [dB] | Site noise level - LAeq 1 hour [dB] |
|---------|------------|----------|--------------------------|-------------------|---------------------|----------------------------|------------------------------|-------------------------------------|
| 1 | 09:27 | 00:18:00 | 64.7 | -3dB | 61.7 | 54.7 | 60.7 | 55.5 |
| 2 | 10:44 | 00:16:00 | 64.6 | -3dB | 61.6 | | 60.6 | 54.9 |
| 2 | 11:11 | 00:08:32 | 65.0 | -3dB | 62.0 | | 61.1 | 52.6 |
| 3 | 11:33 | 00:09:00 | 63.3 | -3dB | 60.3 | | 58.9 | 50.7 |
| 3 | 11:55 | 00:14:30 | 65.0 | -3dB | 62.0 | | 61.1 | 54.9 |
| 3 | 12:25 | 00:05:03 | 66.5 | -3dB | 63.5 | | 62.9 | 52.1 |

Table 5.1 Calculated Results - 20th March

| Set No. | Start time | Duration | Measured Level LAeq [dB] | Façade Correction | Corrected LAeq [dB] | Background Level LAeq [dB] | Noise Contribution LAeq [dB] | Site noise level - LAeq 1 hour [dB] |
|---------|------------|----------|--------------------------|-------------------|---------------------|----------------------------|------------------------------|-------------------------------------|
| 4 | 14:15 | 00:08:59 | 58.2 | -3dB | 55.2 | 50.2 | 53.5 | 45.3 |
| 4 | 14:24 | 00:30:00 | 56.5 | -3dB | 53.5 | | 50.8 | 47.8 |
| 4 | 14:32 | 00:13:01 | 61.7 | -3dB | 58.7 | | 58.0 | 51.4 |

Table 5.2 Calculated Results - 23rd March

5.5. Summary

- 5.5.1. BS 4142 normally requires all results to be rounded to the nearest 1dB, due to the need for accuracy to check the planning conditions; all noise levels have been round to the nearest 0.1dB.
- 5.5.2. Table 5.1 shows an exceedance of the planning condition limits at 9.27am on the 20th March. This reading shows a continuous operation time of 18minutes providing a site noise level over the hour as 55.5dB LAeq (note – the British Standard would round this to 56dB).
- 5.5.3. If the values were rounded to the nearest 1dB as suggested, the events at 10:44am and 11:55am would be at the limit level.
- 5.5.4. The values for the site noise levels in table 5.1 only relate to each individual event. A more accurate representation would include any activity on the site within any 1 hour period.
- 5.5.5. The worst case condition for the hours measured on the 20th March would be from 10:44am to 11:44am as this includes three separate events of site noise, totalling 33minutes and 32 seconds of site noise relating to the hydraulic Hammer. This site noise level for this time period is 57.8dB LAeq 1 hour.
- 5.5.6. The noise levels recorded on the 23rd March to check the noise from the on-site crusher show levels below the planning conditions limit.
- 5.5.7. Whilst the measurement of the noise level when the crusher and a small period of the Hydraulic Hammer usage does show levels below the limits, it should be noted that there was very little activity from the hammer during the recorded period. The Hydraulic hammer was only heard for approximately 4minutes of this recorded period.

6. CONCLUSIONS

- 6.1. The measurements undertaken on the 20th March show both situations where individual events show breaches of the planning limits (9:27am – 55.5dB LAeq 1 hour) and also a worst case condition where the 1 hour LAeq site noise level was 57.8dB
- 6.2. During the assessments, the noise from the excavation works was very distinctive above the general background levels. The hydraulic hammers works are also irregular which can attract additional attention. This is exactly the effect that the British Standard Rating Level caters for as described previously in 2.1.3. However as described previously the Planning Condition does not specifically allow for this nuisance correction.
- 6.3. Whilst listening to the noise on site it became apparent that each time the hammer is used the noise level slightly builds up, this is believed to be related to the depth that the hydraulic hammer goes to with each use. The maximum noise level for each use was always reached just prior to the noise stopping.
- 6.4. Placement of excavation machinery is a big factor within this report. The equipment is not fixed to a single location but moves along the work area designated "Block D". Whilst working on block D the Hydraulic Hammer works from the top along the block which means the machine is constantly visible and also in direct line of site for the majority of the nearby sensitive receivers. Due to the height of this working area and the surrounding receivers there is no barrier attenuation to the noise levels.
- 6.5. The main quarry face is very high, the layout is likely to increase the received noise levels at the residential properties by increasing the reflected noise levels. The layout of this rock face and its ability to reflect noise would be a major factor if it was decided to provide any kind of acoustic barrier between the works and the residential properties as the barrier would need to deal with both the direct source noise and any reflected noise from the quarry face.
- 6.6. Due to the location of the excavation equipment needed to undertake the work and the layout of the nearby residential properties it is likely that the site works will regularly surpass the limit set out in the planning condition.

Report Author

This report was prepared by Matthew Waring who is employed by the Engineering Design Group, which is part of Highways, Capital Development and Waste Management Service of Devon County Council. The author of this report is the holder of an Institute of Acoustics Certificate of Competence in Environmental Noise Measurement and an Institute of Acoustics Diploma in Acoustics and Noise Control.