SOUND BARRIER SOLUTIONS

STONEWOOD HOMES LTD

Noise Impact Assessment and Noise Barrier Specification

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1. INTRODUCTION

Aim of the Assessment

1.1. The aim of this assessment is to predict the potential impact of future noise which may be generated from the new Stonewood housing estate on the Writing Room building at Real World Studios in Box, near Bath.

1.2. The study will predict the likely noise impact from sources such as mixed vehicle movements on site and people, specifically children, playing and shouting within the housing estate. The study will also assess the current ambient noise of the area and factor this into the predicted future noise climate once the housing estate is completed.

1.3. The purpose is to determine the likely noise level change and how much this may impact on the Writing Room and to specify appropriate mitigation measures to protect the studio space from any resulting noise impact.

1.4. The overall goal is to ensure that the general (currently existing) ambient noise level does not increase in the external vicinity of the Writing Room. In order to achieve this, any noise sources emanating from the housing estate would need to be mitigated sufficiently so that they are around 10dB lower than the current ambient levels.

1.5. In order to achieve this, it was also necessary to undertake an ambient noise assessment survey around the writing room. This survey takes into full consideration the current noise climate, which, when there is no other activity, is dominated continually flowing adjacent stream and intermittently by rail traffic near to the studio.

Background Information

1.6. Land adjacent to the Writing Room is currently being developed for residential purposes. The housing estate will consist of buildings which have no external garden spaces at ground level, rather they have open terraces at first floor level and ground floor amenity space. This means that noise from children playing, whilst contained in specific locations, will occur at raised height and as such may travel further.

1.7. The estate will also have parking spaces for around 30 cars and an access road which runs around the perimeter of the estate. At the southern end of the estate this means that cars will pass by the Writing Room at about 10m away, though at low speed.

1.8. The layout of the estate also shows a bin store at the southern end of the site, this means that refuse wagons will also operate close to the Writing Room.

1.9. For this study we have assumed the estate will become home to families with children. Though there are minimal external amenity spaces on the estate, no play park or substantial grassed areas, there are four elevated terraces on each building block. These are the 'garden' spaces in which we would expect noise generated by children may be concentrated.

2. NOISE CRITERIA

2.1. The majority of environmental noise guidance and standards were produced with the intention of protecting the general public from noise exposure to commercial/industrial operations or transportation noise. As such there are no national guidelines which would specifically address the reverse situation, i.e., the noise impact of a housing estate on/into an existent sound-sensitive building.

2.2. However, there are documents which contain 'transferable' concepts which can help us to approach this assessment in a meaningful way. These are discussed below and then their proposed combined use is also summarised.

2.3. It is worth noting that we are not concerned with the acoustic design of the Writing Room itself as part of this study. This is a bespoke space which has been designed to the internal acoustic preferences of the client. Whilst we have been made aware of the general acoustic rating of the facades of the room, we are confining this assessment to the external environmental noise which will be incident upon it. Any mitigation measures required will be limited to that which can be installed in the outside environment rather than proposing any changes to the fabric of the writing room itself.

Noise Policy Statements and Guidance: NPPF & NPSE

2.4. The National Planning Policy Framework NPPF states:

> *Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including **cumulative effects**) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In so doing they should:*
>
> *a) Mitigate and reduce to a minimum the potential **adverse impacts** resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and quality of life.*

b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.5. This assessment will therefore not look at the specific impact of noise from the new estate in isolation but rather the cumulative impact bearing in mind the current ambient noise levels. It will also identify whether adverse impacts may be likely to occur at the studio and any mitigation that might be required.

2.6. The NPSE: Noise Policy Statement for England aims '*through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development, to:*

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life.*

2.7. NPSE provides general guidance which enables decisions to be made regarding the acceptable noise burden to place on society, using three key phrases – the No Observed Effect Level (NOEL), the Lowest Observed Adverse Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (SOAEL). By inference, the Adverse Effect Level falls between LOAEL and SOAEL.

2.8. NPPF and NPSE do not provide any objective guidance to assess the likelihood of causing an Adverse Impact. In our opinion therefore, to breach the LOAEL would be to cause adverse impact.

2.9. In the noise criteria chosen below the noise levels that represent LOAEL have also been determined to carry out the assessment objectively. Appendix C also provides the NPPG Noise Exposure Hierarchy Table which relates perception of noise to its effect and the resultant action that might be recommended.

IOA/CIEH Guidelines for Level Change

2.10. The IOA/CIEH Working party produced guidelines to assess the impact of a change to the ambient noise level in terms of the subjective response and its significance. The impact scale adopted in an assessment is shown in the table below. This scale is now readily accepted in environmental noise assessments for transport, industrial, construction and new housing applications. It also enables an assessment to be carried out of the predicted change of the (cumulative) noise level due to the addition of noise from the new housing estate to the current ambient noise field around the studio.

Change in Noise Level dB(A)	Subjective Response	Significance
0	No change	No Impact
0.1 - 2.9	Barely Perceptible	Minor Impact
3.0 - 4.9	Noticeable	Moderate Impact
5.0 - 9.9	Up to a doubling or halving of loudness	Substantial Impact

This scale can be related directly to the NPSE guidance effect levels (see below). Avoiding an increase in the cumulative noise level of +3dB would be to avoid adverse impact.

Change in Noise Level dB(A)	NPSE Effect Level
0	NOEL
0.1 - 2.9	LOAEL
3.0 - 4.9	ADVERSE
5.0 - 9.9	SOAEL

BS8233:2014

2.11. The Scope for BS8233:2014 states: *It is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building"*.

2.12. Whilst its application is for new-build residential properties, it does define a set of indoor noise levels (tabulated below) for residential properties which relate to external noise levels. These originate from WHO guidelines for general environmental noise. In the absence of any other specifically relevant guidelines, these levels can be used to derive criteria to assess the impact of noise on the writing room.

2.13. **INTERNAL ROOM LEVELS**

7.7.2 Internal ambient noise levels for dwellings

In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values in Table 4.

Table 4 **Indoor ambient noise levels for dwellings**

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

2.14. These internal noise levels relate to steady external noise sources and are assessed over a long timeframe (16 hours). For **Daytime**, BS8233:2014 requires that an Internal Level of **35dB LAeq$_{16hr}$** is achieved for Living

room spaces and for resting in Bedrooms. External noise levels are required to meet the guideline values given in Table 4 above, assuming windows are (partially) open.

2.15. If the windows are assumed to be partially open, the internal noise level is assumed to be only 10-15 dB lower than the external noise level. Taking the lower attenuation figure, daytime living conditions would therefore be achievable with partially open windows in all rooms if the external noise level is no more than **45dB $LAeq_{16hr}$**.

2.16. We would therefore not expect additional noise from new sources on the housing estate to exceed **45dB(A) $LAeq_{16hr}$** when measured (or predicted) 1m from an external window façade for daytime conditions. For the sake of NPSE we would regard this as the LOAEL threshold.

Summarising the Noise Criteria

2.17. As was stated in 2.1 above, there is no clear-cut piece of documentation which defines this assessment scenario. In any case, any recommended internal noise levels which might be proposed for a studio space are irrelevant as the designer of the studio is at liberty to specify the internal climate of the space however they wish. We have also been advised by the client that the transmission loss of the facades of the writing room was designed to be 40dB.

2.18. As the writing room has been present on the site for many years, it is fair to assume that it functions adequately within the context of the current external ambient noise conditions. It is therefore paramount to ensure that any new noise which is added into this system from the housing estate does not cause any adverse change in the overall ambient levels.

2.19. Drawing on the concepts within the NPSE and IOA/CIEH guidance we can see that any noise change up to 2.9dB would be considered LOAEL - as barely perceptible and of minor impact within a residential application. Within the context of a recording studio however, we would expect the occupants to be more sensitive to noise than in most other occupations. Our goal would therefore be to limit noise change to as low as practicably possible or as closed to NOEL (No Observed Effect Level) as is practically possible.

2.20. BS8233 is referenced above with specific regard to window opening behaviour. The document describes internal levels required for quiet spaces (i.e., for sleeping) and informs the reader that if windows are left partially open then any transmission loss afforded by the fabric of the building itself is reduced to as low as 10dB because of the windows.

2.21. Studio space designers would ordinarily be well aware of this fact and as such usually design spaces with solid facades. This assessment therefore assumes that any glazing around the writing room facades are non-opening windows.

2.22. In Chapter 3 below we have shown that monitored current Ambient noise levels external to the Writing Room never falls below **52 dBA LAeq,$_T$** to the north and west of the room and **44 dBA LAeq,$_T$** to the (more sheltered) southern side of the room. These are also shown in the time histories in Appendix A & B. The flatness of the time histories is due to the continual 24/7 noise from the adjacent stream. For this assessment we have assumed a typical noise measurement uncertainty of +/- 1dB.

2.23. According to para 2.7-2.10 above, a change in noise level of less than 3dB would be classed as LOAEL, being barely perceptible and of minor impact in the long term. Therefore, the cumulative external Ambient noise level should not be greater than **55dBA LAeq,$_T$** (52 + 3 dB) and **47dBA LAeq,$_T$** (44 + 3 dB) for it to be considered LOAEL. In this case the timeframe "T" denotes the typical worst case time period over which housing estate noise may occur.

2.24. However, in practise we would want to achieve a greater performance than this and mitigate noise change so that there is no overall perceptible increase at all. In order to do this, we would aim to limit the additional noise from the estate to as close to 10dB below the current ambient levels as possible, i.e., **42dB LAeq,$_T$** and **32dB LAeq,$_T$** external to the north and south of the Writing Room respectively. In this way, the overall combined external levels would be predicted to remain at 52dB and 44dB.

3. NOISE SURVEY – OCTOBER 2023

Ambient Noise Survey *(Ref Figure 1 & Appendix A, B)*

3.1. An ambient noise survey was carried out between the 12th and 17th of October 2023 at two locations around the Writing Room. The first location was on the western side of the room opposite the entrance and the second location was in a more sheltered grassed area opposite the south facing façade. During the period the weather was also monitored (at the 1st location) with an integrated weather station assessing windspeed, rainfall, temperature and humidity. The weather itself was mixed with periods of rain, though the windspeed itself never exceeded 5m/s. Period of rain were filtered out of the analysis.

3.2. The objective was to determine the Ambient noise levels during a typical weekend when general noise levels should be low, and more importantly, there should be no construction work happening on the housing estate. At the time of the assessment, it was clear that there is a consistent noise of flowing water from the various streams ponds and sluice gates which make up the water features around the grounds of Real World Studios.

3.3. Appendix A shows the Location 1 LAeq time history over the 14th and 15th October consistently never fell below **52 dB(A) LAeq,T**. At Location 2 which is more sheltered, we recorded a consistent **44 dB(A) LAeq,T**. The time history for this location is given in Appendix B. Bearing in mind the weather fluctuations we have assumed a measurement uncertainty of +/-1dB.

Measurement Apparatus

3.4. For the noise survey the following was deployed:

Integrating Real Time Analysers	01-dB type FUSION (type 1)	Calibrated: 26th Oct 2021
Microphones:	01-dB type 40CD half inch	Calibrated: 26th Oct 2021
Calibrator:	01-dB type CAL31 (class 1)	Calibrated: 26th Oct 2021
Integrated Weather Station	VAISALA WXT536 – 6 transducers	n/a

3.5. The analysers were verified according to the procedure given in BS7580:1997. The analysers also conform to BS7580:1997 verifying conformance to BSEN60851:1994, Type 1, BSEN60804:1994 Type 1.

4. METHOD OF ANALYSIS

Constructing the Computer Noise Model

4.1. In order to carry out the assessment, the computer noise modelling software package "CadnaA 2023" was used. This is a three-dimensional computational system allowing for precise acoustic modelling of particular environmental noise sources: road, rail traffic and a wide variety of industrial sources of noise.

4.2. It predicts how the noise will interact with adjacent buildings, taking into account topography and different ground conditions. The software was used to produce a model of expected future noise sources on the housing estate and to predict the specific combined noise levels of these sources at various positions around the facades of the Writing Room.

4.3. CadnaA:2023 can calculate the propagation of noise using various methods. For the noise from children in the housing estate the industrial standard method ISO 9613-2 was used and for the road traffic the method CRTN was employed. The model takes into account the local land topography as well as all existing surrounding buildings structures and other relevant features. The noise model also allows for reflective surfaces where appropriate in the calculations. The noise modelling and calculations assumed a ground

absorption of 0.6 for semi-soft ground to represent the lawn space and assumed two orders of reflection for all reflective surfaces.

Simulating Average Noise from Children

4.4. CadnaA is able to assess both transport and 'industrial' noise sources using different calculation methods but provide a combined final incident noise level at the receiver point. This means that in addition to the mixed vehicle noise we are able to program the model to simulate the noise which might be generated by children playing and shouting on the terraced areas.

4.5. The approach taken was to program single point sources at a nominal height of 1.2m (to represent the voice height of a single typical child) above the garden-space height of each of the 16 terraces. In addition, a further 6 'children' were programmed at ground floor level, with 1 on each of the small, grassed areas around the estate. These locations can be seen in Fig 2. This approach is designed to give an average spread of noise from all over the estate. Of course, in practise occupants of some properties won't have any children and others may well have a few.

4.6. In terms of characterising the noise of playing/shouting children, we can draw upon Building Bulletin 93 (2003 Edition). This provides a Design Guide for Acoustics in Schools. In particular it characterises volumes of speech and how the generated sound power varies for normal speech, raised speech and shouting – as follows:

Vocal Effort	Sound Level	
	Power (Watts)	Pressure dB(A) @ 1m
Normal	10 μW	60
Raised	100 μW	70
Shouting	1000 μW	80

4.7. Put simply, one child shouting generates the same sound power as 10 children with raised voices, or 100 children talking with normal effort. The estate can be modelled by estimating the proportion of children shouting, using raised voices and simply talking at any one time.

4.8. To simulate this, we have assumed that at any one time 20% of children are talking, 20% are raising their voices, and 2% are shouting. The rest (48%) are silent. Since we have estimated for 22 children all out on their respective terraces at any one time, we are assuming there is almost always one child who is shouting but normally only one. We have also utilised stock data from other assessments where we have monitored the noise of children playing on behalf of schools and sports facilities.

4.9. Based on these proportions and our stock data, the predicted noise level 10 m from an individual 'Average child' noise source was determined to be 52dB(A). In addition to this is would be important to also estimate

the impact of isolated loud shouts which whilst very short lived could also be intrusive in their own right. This would be assessed in a slightly different way.

Simulating Noise from Shouting Children

4.10. In addition to the 'average' scenario, we also wanted to focus in on the situation where a child might be shouting from the closest terrace to the writing room, both at the 80dB value given in the table above and also at an extreme 90dB value. Such shouts would be very short lived, almost instantaneous events but possibly could have an adverse impact on the writing room, nonetheless.

4.11. In order to do this, as shown in Figure 3, we simulated a single point source on the terrace of property No. 1. We did this at 80dB, and then again at 90dB (results are shown in the tables section). The scenario also includes for the average traffic noise levels being present too, as in the scenario for the average child noise.

Simulating Noise from Road Traffic in the Housing Estate

4.12. According to the design drawings, the new estate will be equipped with parking spaces for up to 34 cars. In addition, there is almost certain to be occasional HGV movement in the estate. In particular there will be a weekly Waste Collection vehicle which will need to drive parallel to the Writing Room and stop to collect bins from the bin store in the south-west corner of the estate.

4.13. Within CadnaA the potential traffic has been modelled using a road source and assessed according to CRTN – the Calculation for Road Traffic Noise, which is the UK national standard calculation method. We have programmed the calculation to simulate a likely but fair worst-case scenario which is intended to represent an hour-long period during the weekday morning or evening 'rush'. This would include for when the waste is being collected and allows for half of the cars to be leaving for/returning from work or school runs, all within the same hour.

4.14. Although the model could have been programmed to include for all the cars leaving at the same time in practise, not all will leave at all, and the movements will typically be spread out over a longer period of time.

Writing Room Façade Receptors

4.15. In order to gain an understanding of incident noise around the writing room, the model was programmed with 8 external façade receptors which would quantify the noise impact on the different facades of the building. These are shown in Figure 1.

4.16. These Ground floor height receptors were modelled at a height of 1.5m in relation to the Writing Room. In calculating sound propagation ISO9613-2 includes for any façade sound reflection in the predicted noise level.

Noise Barrier Mitigation Option

4.17. The only real way to mitigate the noise from both road traffic and people on the housing estate is to utilise a proprietary noise barrier system. This works to provide an insulation barrier between the estate and the studio grounds. As the writing room sits closest to the boundary of the two areas, this type of mitigation may be particularly effective.

4.18. The only real place to install a barrier would be along the southern boundary line of the site, running around and along side the bin storage area. The barrier would be of high surface mass and reflective in character and would need to be built to a height of **3.5m** for its whole optimised length of **56 meters**. More details on product type and specification are given below in the Conclusions section.

Analysis Uncertainty

4.19. CRTN is the UK Standard method of calculating sound levels from Road Traffic noise. In its purest form and independent of measured data, CRTN estimates results based on a single ray calculation for a singular point. Similarly, ISO9613-2 is also a validated method of calculating sound levels. In its purest form independent of measured data, ISO9613-2 estimates its accuracy for broadband noise for heights of 0 to 5m as being +/-3dB. However, this too is based on a single ray calculation for a singular point.

4.20. The Cadnaa noise model for this assessment is built up of the order of 100 ray calculations for typically 5000 separate analysis points. The accuracy is therefore greatly enhanced as it is performing thousands of individual ISO9613-2 and CRTN calculations. We would therefore estimate the uncertainty of predicted noise calculations in this analysis as being in the region of +/-1dB.

5. NOISE IMPACT ASSESSMENT

Unmitigated Façade Specific Noise Levels *(Ref: Tables 1a-3a, Map 1)*

Road Traffic & 'Average' Child Noise Scenario

5.1. Tables 1a, 2a and 3a show at each of 8 façade locations, the predicted Combined Specific Noise Levels (SNL) due to the noise sources on the new housing estate. First for the road traffic with the 'Average Child' noise behaviour (1a), then for the traffic with an instantaneous 80dB Shouting Child (2a), and finally for the extreme situation of the road traffic with a child shouting at 90dB (3a).

5.2. They also show the current Ambient noise level for each facade location, the future predicted 'new' ambient façade level and the excess of this over the current ambient level.

5.3. Examination of Table 1a shows that the current ambient noise levels are predicted to increase by 0-2dB due to the housing development for locations 1-7 but by up to 6dB at location 8.

5.4. According to the IOA/CIEH scale, since receptors 1-7 are predicted to experience only a modest increase in noise of less than 3dB, the change in level will be barely perceptible with only a minor impact expected. According to NPSE the change would be considered LOAEL – Lowest Observed Adverse Impact Effect.

5.5. However, in the case of the rear façade, location 8, a change of 6dB would constitute a substantial impact. It is worth noting that we have not specifically measured the current ambient noise levels on this side of the writing room and so the given current level of 44dB could be an under-estimate leading to an inflated excess level over ambient. Nonetheless, the result suggests that noise mitigation should certainly be utilised.

Road Traffic & 'Shouting' Child Noise Scenarios

5.6. When we examine tables 2a and 3a we see that there is very little difference between the 'average child' scenario and the 80dB shouting child scenario. However, when we look at the extreme scenario of a 90dB shouting child then noise impact understandably increases.

5.7. In this situation locations 1-3 would see increases of 3-4dB and location 8 would see a 10dB increase above the current ambient levels. (again, it is likely that the result for location 8 is an over-estimate based on the conservative approach to selecting the current ambient level of 44dB for this area).

Mitigated Façade Specific Noise Levels *(Ref: Tables 1b-3b, Map 2)*

Road Traffic & 'Average' Child Noise Scenario

5.8. The model was programmed with a 3.5m high 56 meter long Reflective Noise Barrier running along the boundary line between the writing room and the housing estate (see Fig 1). The calculations were run again to see what impact this would have in reducing the noise impact on the writing room.

5.9. The results are contained in Tables 1b, 2b and 3b which again show the predicted Combined Specific Noise Levels (SNL) due to the noise sources on the new housing estate. First for the road traffic with the 'Average Child' noise behaviour (1b), then for the traffic with an instantaneous 80dB Shouting Child (2b), and finally for the extreme situation of the road traffic with a child shouting at 90dB (3b).

5.10. We can see that in the case of the 'Average child' scenario (Table 1b), the noise barrier has reduced the noise levels sufficiently such that locations 1-7 are not predicted to show an increase in the current ambient levels. This would be classed as NOEL according to NPSE. For location 8 we see that there is a possible increase of just 1dB, (which is likely to be an over-estimate as discussed above) which based on the IOA/CIEH guidelines would be barely perceptible and of minor impact.

5.11. Closer inspection of the Combined SNL column, reveals that the barrier is predicted to reduce the noise levels due to the housing estate by up to 14dB (for location 1) when compared with the unmitigated scenario (table 1a). It can also be seen that our goal of keeping the housing estate noise levels to around 10dB below the current ambient levels has been achieved at almost all of the façade locations.

5.12. This reduction of the source noise impact can also be seen in the **Noise Contour Maps.** Map 1 shows the predicted unmitigated spread of the Combined Specific Noise Levels from the housing estate sources and Map 2 shows the spread of the same with the noise barrier in place. The difference can be clearly seen.

5.13. It should be understood that both of these maps are independent of the current ambient noise levels (if they were to be factored in then the maps would look almost identical due to the site noise getting masked by the ambient levels).

Road Traffic & 'Shouting' Child Noise Scenarios

5.14. The predicted results for the mitigated scenario for the 80dB Shouting Child scenario (Table 2b) are almost identical to the Average Child Scenario. This is because the vehicle noise element is still expected to dominate the noise even when a child is shouting. Here we see that just 3 of the façade locations may experience an increase in ambient noise of 1dB. This is a barely perceptible change according to the guidance. It should also be remembered that this scenario is addressing very short-lived noise events rather than a continuous source of noise.

5.15. Finally, Table 3b shows the extreme case of a 90dB shouting child scenario, again, an instantaneous, very short event. In this case with the noise barrier in place the worst impacts are now predicted to only be 1-3dB in excess of ambient. According to IOA/CIEH guidance, again, these would be barely perceptible level increases.

6. CONCLUSIONS & RECOMMENDATIONS

Impact of New Estate on Ambient Noise Levels for the Writing Room

6.1. This study has examined the predicted impact of road traffic and 'average' general noise from children (playing on terrace spaces within the new housing estate), on the Writing Room at Real World Studios. The goal was to ensure that noise impact from the estate would have a negligible impact on the Writing Room.

6.2. The predicted resultant change in the current ambient noise level was shown to be less than 3dB at three of the four facades of the writing room. According to IOA/CIEH guidance this this change will be barely perceptible, is predicted to have only a minor impact and would be considered LOAEL under NPSE.

6.3. However, one façade (although the results may be overestimated) shows the potential for a change in the ambient level of up to 6dB which would be a substantial adverse impact. In order to ensure that no discernible impact would be observed at the Writing Room it would be necessary to mitigate the noise to levels around 10dB below the current ambient noise of the area.

6.4. The study found that this could be achieved with the introduction of a **3.5m high, 56m long Reflective noise barrier** along the southern boundary of the housing estate. With this in place noise from the estate would be reduced to such levels that it is not discernible above the current ambient noise levels of the area.

6.5. Even in the worst-case scenarios of children shouting on the closet terraces, it was found that even shouts of around 90dB would only be barely perceptible at the facades of the writing room. We are therefore confident that with the mitigation scheme proposed in place, noise from the new housing estate will be in-audible from inside the writing room.

Noise Barrier Scheme Options

6.6. Choosing which product option best suits the development will depend on the aesthetic appearance required, construction constraints and other factors such as the use/disposal of site soil. We have based the noise barrier element on the Reflective **Gramm NATURAL SoundBlok Plus** (Double-skinned) system. The product sheets for this are provided in Appendix E. We would not recommend single skinned timber systems for reasons given below.

CPR, CE Marking & Durability

6.7. Whilst this is not strictly a road traffic noise application, we have based the noise barrier specification on those required for road traffic noise according to CPR as there are the most robust in the industry. In order

to meet the Construction Products Regulation (CPR), there is a requirement for all road traffic noise barriers to be CE Marked with a declaration of performance (DoP) in accordance with the harmonised product standard (hEN) BS14388:2005. This covers acoustic, mechanical and structural performance as well as durability of performance, environmental factors and safety. The Gramm NATURAL SoundBlok Plus is CE marked for use as a road traffic noise barrier and is therefore fully compliant with the CPR.

6.8. Whilst double skinned timber barriers have been shown to be highly durable, single skinned timber barriers are not. The Transport Research Laboratory published the document TRL PPR490 'The acoustic durability of timber barriers on England's strategic road network' which tested existing timber noise barriers on the network. It states that single-leaf timber reflective noise barriers will (on average) degrade by approximately 7dB in the first 5 years.

6.9. With a high surface density of 30 kg/sqm, the Natural SoundBlok Plus will provide sufficient insulation through its surface for low frequency noise, for example form idling cars or bin-lorries. Its structure makes it acoustically tight to also insulate against higher frequency noise, for example from shouting children.

CE Marked Noise Barrier Specification

6.10. Below is outlined the minimum Product Performance Specification for the barrier based on the hEN: BSEN 14388:2005:

No.	Required Characteristic	Test Method	Minimum Value/Class	Harmonised Product Standard
1	Sound Insulation	BSEN 1793-2:1997	30dB (Class B3)	BSEN 14388:2005
2	Maximum normal (90°) load an acoustic element can withstand (wind and static load)	BSEN 1794-1:2003 Annex A	1.5 KN/m	BSEN 14388:2005
3	Expected Durability (Non-Acoustic)	BSEN 14389-2:2004	40 years	BSEN 14388:2005
4	Expected Acoustic Durability	prEN 14389-1	2 dB in 20 years (Max fall in DL_R)	BSEN 14388:2005
5	*Resistance to Fire*	*EN 1794-2:2003*	*Class 3*	*BSEN 14388:2005 (Recommended)*
6	*Surface Density (product)*		*30 kg/sqm*	*(Recommended)*

Recommended Contractor

6.11. This report has been carried out based on the specification of this noise barrier product. It is supplied and installed by the following contractor who comes highly recommended by Sound Barrier Solutions Ltd and are leading UK noise barrier installers. We would recommend their continued involvement to confirm barrier location and installation.

GRAMM BARRIERS:

Mark Whittle

Tel: 01323 872243

E-mail: mark@grammbarriers.com

7. TABLES

TABLE 1a: Façade Noise Levels – 'Average Child' - Unmitigated

Receiver	Combined SNL	Ambient	SNL + Ambient	Excess over Ambient
1	50	52	54	2
2	49	52	54	2
3	48	52	53	1
4	43	52	52	0
5	35	44	44	0
6	35	44	45	1
7	36	44	45	1
8	48	44	50	6

TABLE 1b: Façade Noise Levels – 'Average Child' - Mitigated

Receiver	Combined SNL	Ambient	SNL + Ambient	Excess over Ambient
1	36	52	52	0
2	37	52	52	0
3	36	52	52	0
4	34	52	52	0
5	34	44	44	0
6	34	44	44	0
7	35	44	44	0
8	37	44	45	1

TABLE 2a: Façade Noise Levels – '80dB Shouting Child' - Unmitigated

Receiver	Combined SNL	Ambient	SNL + Ambient	Excess over Ambient
1	50	52	54	2
2	50	52	54	2
3	48	52	54	2
4	43	52	53	1
5	36	44	45	1
6	36	44	45	1
7	37	44	45	1
8	49	44	50	6

TABLE 2b: Façade Noise Levels – '80dB Shouting Child' - Mitigated

Receiver	Combined SNL	Ambient	SNL + Ambient	Excess over Ambient
1	37	52	52	0
2	38	52	52	0
3	37	52	52	0
4	35	52	52	0
5	35	44	45	1
6	34	44	44	0
7	35	44	45	1
8	38	44	45	1

TABLE 3a: Façade Noise Levels – '90dB Shouting Child' - Unmitigated

Receiver	Combined SNL	Ambient	SNL + Ambient	Excess over Ambient
1	53	52	56	4
2	52	52	55	3
3	52	52	55	3
4	46	52	53	1
5	42	44	46	2
6	39	44	45	1
7	40	44	46	2
8	53	44	54	10

TABLE 3b: Façade Noise Levels – '90dB Shouting Child' - Mitigated

Receiver	Combined SNL	Ambient	SNL + Ambient	Excess over Ambient
1	42	52	52	0
2	43	52	53	1
3	43	52	53	1
4	41	52	52	0
5	42	44	46	2
6	38	44	45	1
7	38	44	45	1
8	44	44	47	3

8. FIGURES

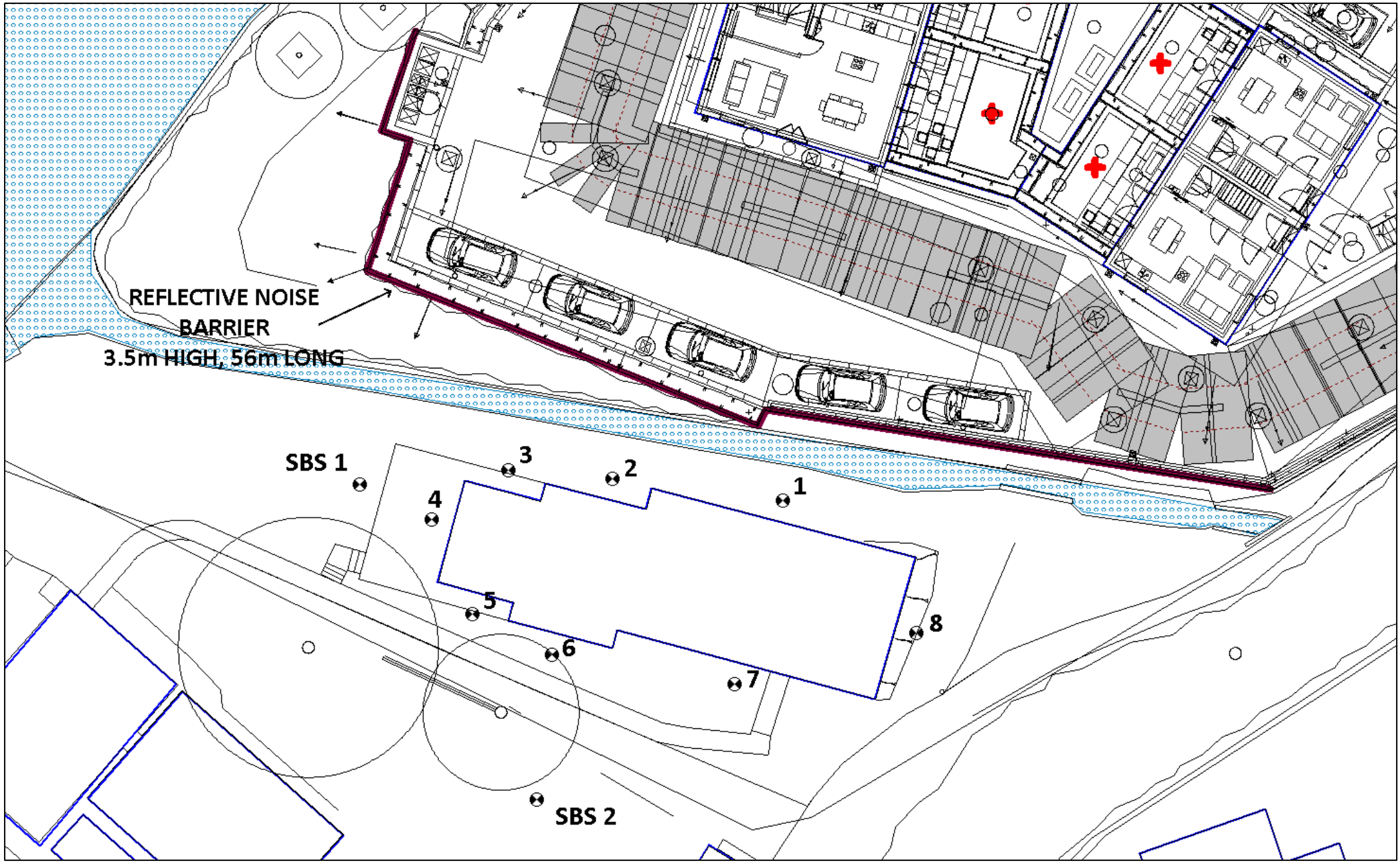


FIGURE 1: WRITING ROOM – MONITORING POSITIONS, FAÇADE LOCATIONS & NOISE BARRIER



FIGURE 2: NEW HOUSING ESTATE – NOISE SOURCE LOCATIONS –'AVERAGE CHILD'

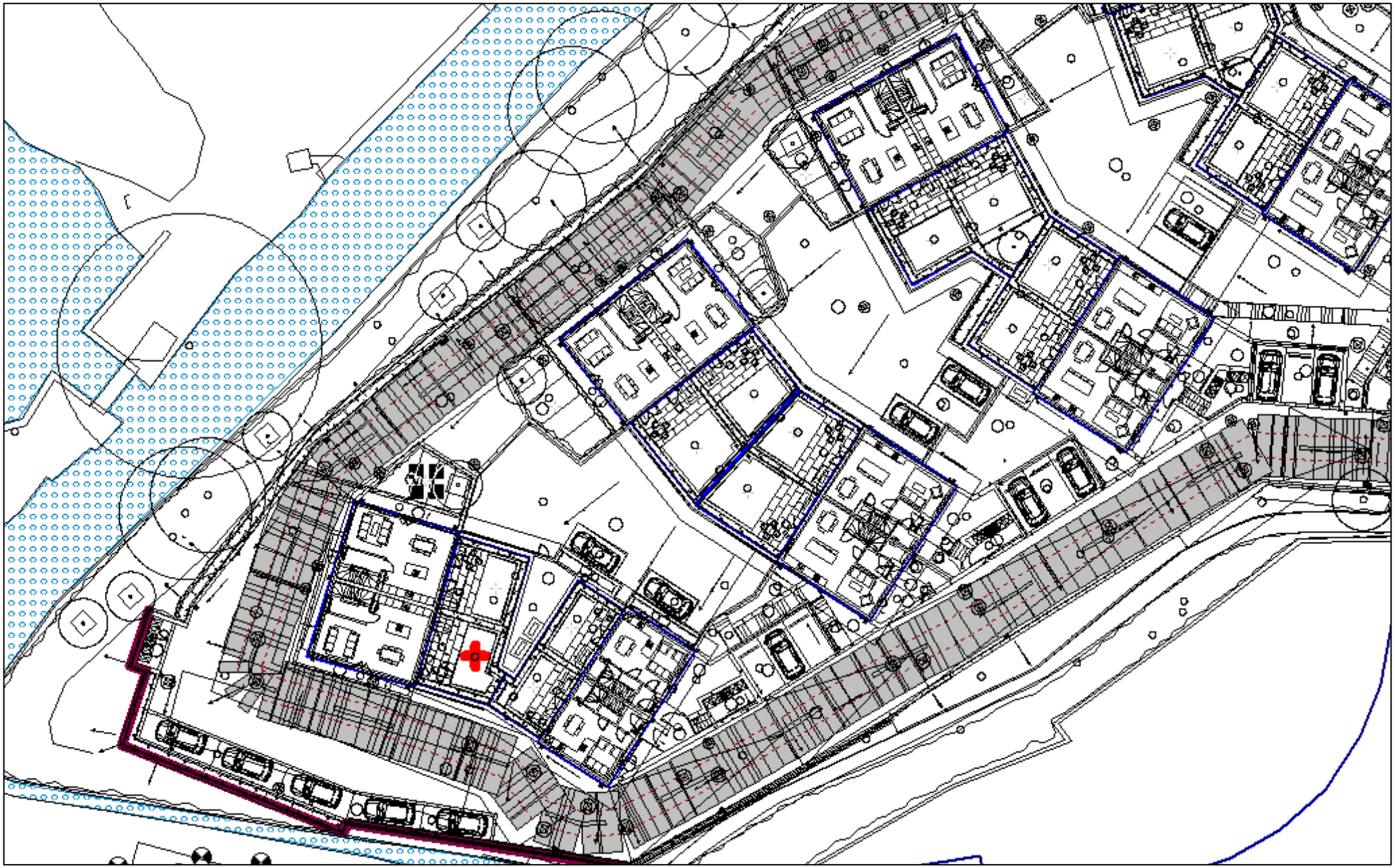


FIGURE 3: NEW HOUSING ESTATE – NOISE SOURCE LOCATIONS –'SHOUTING CHILD'



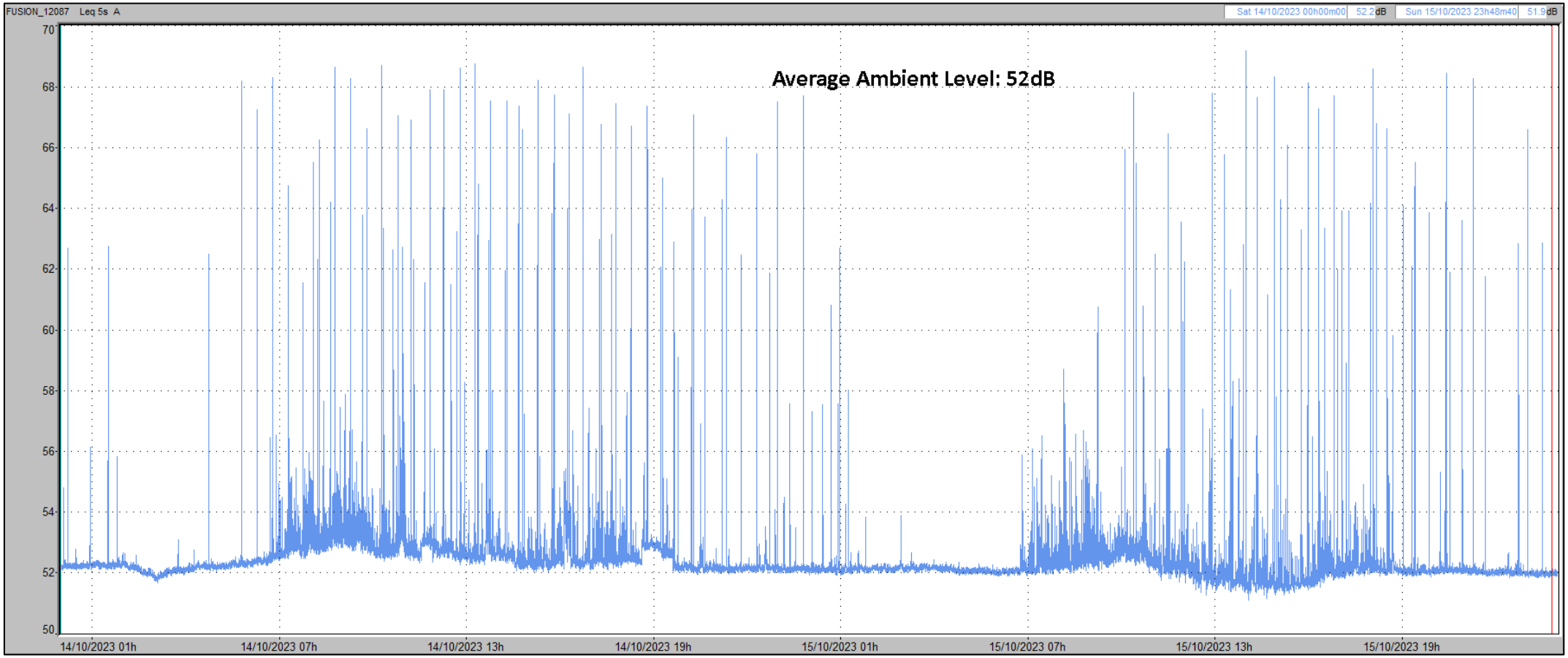
FIGURE 4: MAP 1 – SPECIFIC NOISE LEVELS – AVERAGE CHILD SCENARIO - UNMITIGATED – LAeq,T – dB(A)



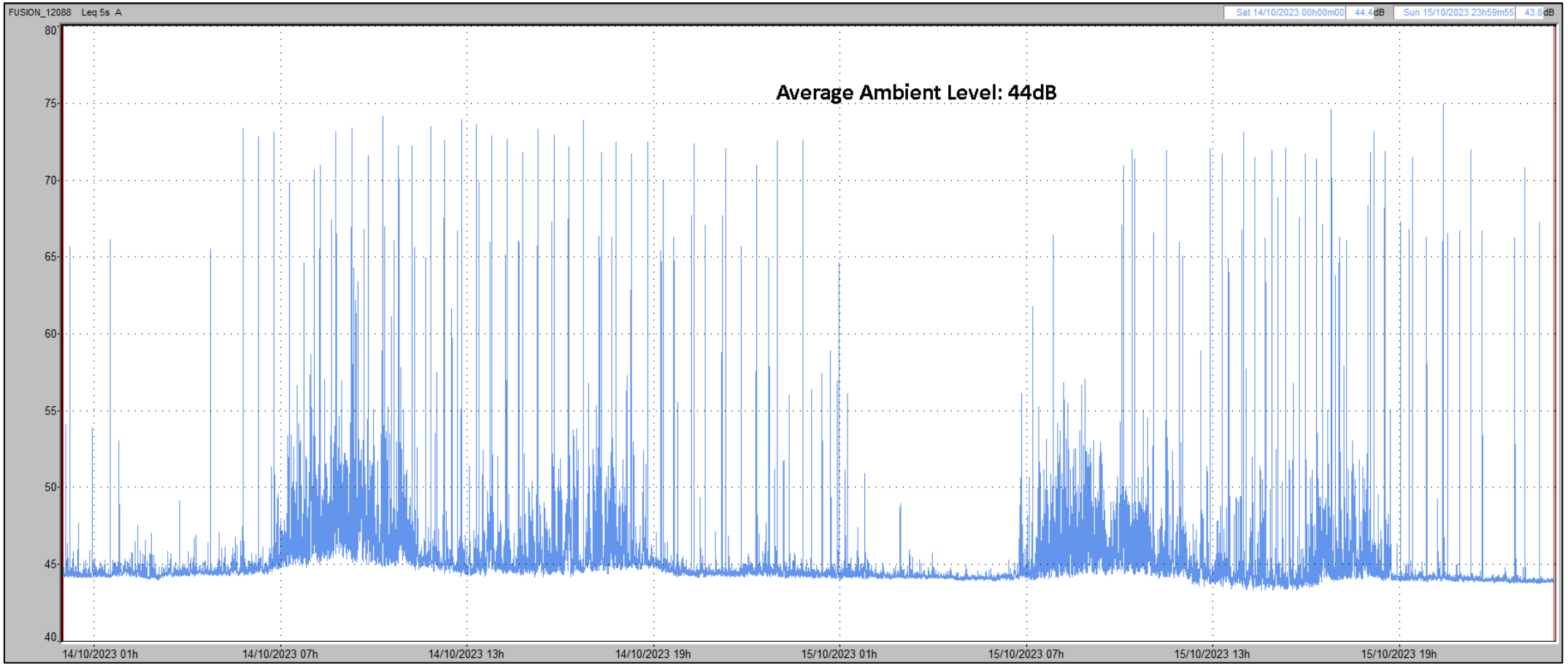
FIGURE 5: MAP 2 – SPECIFIC NOISE LEVELS – AVERAGE CHILD SCENARIO - MITIGATED – LAeq,T – dB(A)

9. APPENDICES

APPENDIX A
SBS 1: Ambient Noise Time-History



APPENDIX B
SBS 2: Ambient Noise Time-History



APPENDIX C: Noise Monitoring Location Photos.

SBS Monitoring Location 1



SBS Monitoring Location 2



APPENDIX D
NPPG – Noise Exposure Hierarchy Table

Perception	Examples of outcomes	Increasing effect level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, eg turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, eg avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, eg regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, eg auditory and non-auditory	Unacceptable Adverse Effect	Prevent

APPENDIX E: Noise Barrier Product Data Sheets

GRAMM
BARRIER SYSTEMS

Noise Barrier - Acoustic Fencing

Tried, Tested, Trusted



Gramm Barrier Systems SoundBlok Range

NATURALSoundBlok® REFLECTIVE

CE

Gramm Barrier Systems NATURALSoundBlok barrier range has a classic look most suited to rural environments. Gramm have spent a great deal of time developing our Timber Noise Barrier Range to provide high decibel reductions whilst maintain a 30 year maintenance free design life.

Unlike other systems, Gramm do NOT use a tongue and groove system, as timber naturally wants to expand and contract in the varying weather conditions which causes gaps to open along the joints allowing noise to pass through.

Gramm Barrier systems NATURALSoundBlok timber noise barrier range uses a unique double acoustic board design on structural supports which allow the timber to move whilst maintaining an acoustic seal for the full life span.

Our range of timber barriers can be manufactured to suit the requirements of each individual site, ensuring the barrier system provides the highest level of sound reduction available.

Gramm Barrier systems NATURALSoundBlok® Reflective barrier are constructed off site under strict quality controls providing the highest level of construction which conforms to all the latest standards required for all sectors. Alternatively, our Timber Reflective range can be installed piece meal on site, to allow for varying ground conditions and obstacles.



NATURALSoundBlok® Reflective panels are constructed using incised, Tanalith E pressure treated timber which is sourced from an FSC approved supplier.

The panels consist of horizontal structural rails and structural gravel boards. The face side is then clad with vertical acoustic boards and cover boards and surmounted by a weathered calling. All elements are fixed using stainless steel annular ring shanked nails and fixings.

Applications

Road | Rail | Airport | Commercial | Industrial | Utilities | Ports | Defence | Residential | Housing

NATURAL**SoundBlok®**
REFLECTIVE

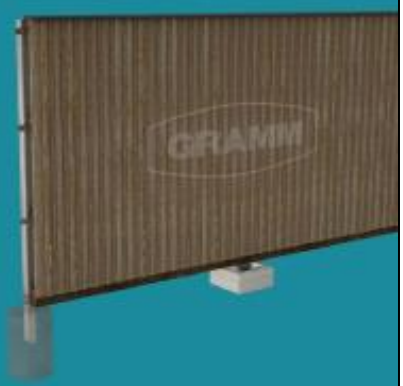
Tried, Tested, Trusted

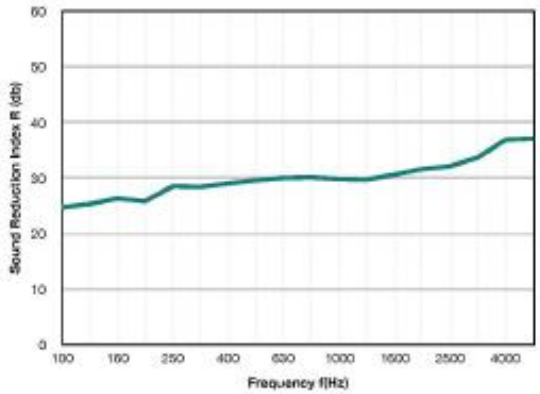




Technical Information

- Barrier Rating: A0, B3
- Absorption: 0 Dla
- Reflection: 30 DLr
- Height: From 0.5m - 10m (Bespoke Heights available on request)
- Lengths: 1.0m - 3.0m (Bespoke Lengths available on request)
- Material: Timber
- Weight: 26.4kg/m²
- Finish: Tanalith E Treatment in Green or Brown
- Design Life: 30 years





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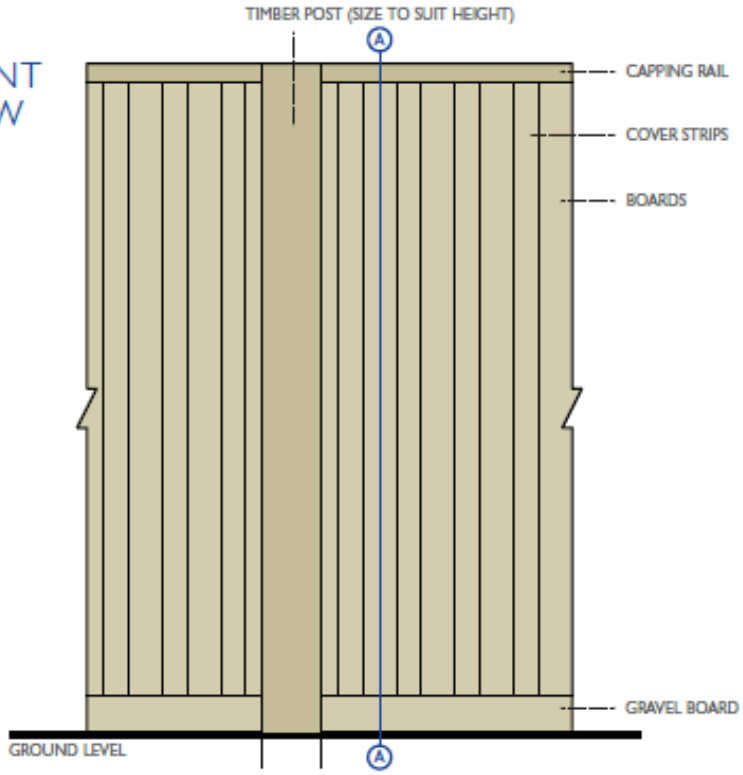
NATURAL**SoundBlok**®
REFLECTIVE

GRAMM BARRIER SYSTEMS

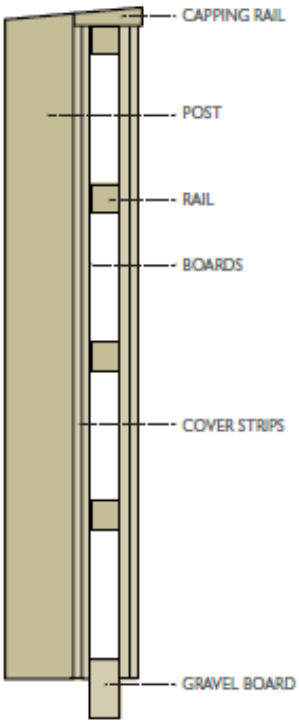
DOUBLE SIDED REFLECTIVE SOUND SCREEN FITTED TO TIMBER POSTS

AUGUST 2012

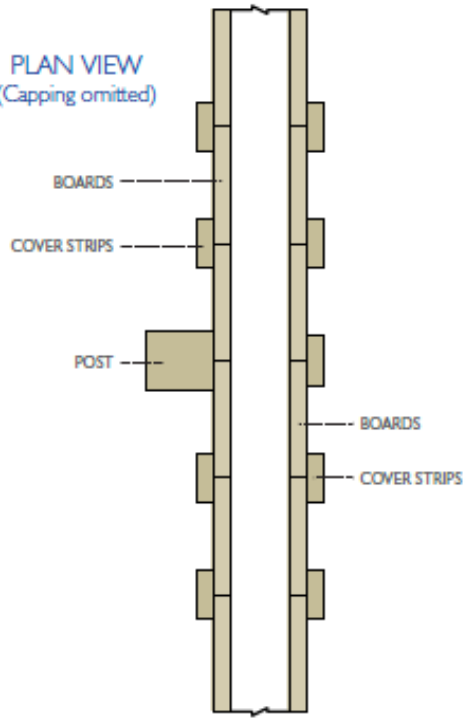
FRONT VIEW



SECTION A-A



PLAN VIEW (Capping omitted)



PLEASE NOTE:

1. CONFORMS AND TESTED TO BS EN 1793. ALSO TESTED AND COMPLIES TO BS EN 1794-1 AND BS EN 1794-2.
2. COMPLIES WITH HIGHWAYS SECTOR SCHEME 2C FOR THE PREFABRICATION OF ENVIRONMENTAL BARRIERS.
3. DOUBLE SIDED SOUND SCREEN FITTED TO TIMBER POSTS FOR ILLUSTRATION PURPOSES ONLY. STEEL POSTS CAN BE AN ALTERNATIVE.
4. STRUCTURAL CALCULATIONS MAY BE REQUIRED BY QUALIFIED PERSONS, NO RESPONSIBILITY CAN BE ACCEPTED BY USING THIS DESIGN WITHOUT PROFESSIONAL ADVICE.
5. DESIGN IN ACCORDANCE WITH SPECIFICATION FOR HIGHWAY WORKS CLAUSE 2504. TREATMENT TO SECTOR SCHEME 4.
6. HEIGHT OF SOUND SCREEN VARIABLE TO SUIT SPECIFIC LOCATIONS. POST CENTRES AT 3.0M UNLESS OTHERWISE SPECIFIED.

GRAMM