

NoiseAssess

Acoustics, Noise and Vibration Consultants

Project:	Station Road, Darton S75 5AA Proposed residential development
Scope of Report	Assessment of noise from external sources
Client:	JRP Architects
Report Reference:	12829.01.v1 November 2019
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1.0 INTRODUCTION

Proposal

- 1.1 The proposal involves the demolition of the existing buildings and the construction of new build-residential homes. The site location is shown on Figure 1. This assessment has been based on the proposed site layout plan produced by JRP architects as shown in Figure 2.

Scope of Report

- 1.2 This report relates to the potential impact of existing noise sources on the proposed dwellings. The report covers potential garden noise levels and boundary treatment and the potential noise intrusion to the proposed properties and building envelope design. The report does not include the assessment of potential noise generation by new noise sources introduced as part of the new development.

Site Context

- 1.3 The site is in a mainly residential area. Station Road is adjacent to the site to the northeast and a railway line runs along the south-western boundary on an embankment. There are industrial premises to the southwest on the other side of the railway embankment.

Planning

- 1.4 Planning Authority and Consultations:

Planning Authority:	Barnsley Metropolitan Borough Council
Consultee on Noise:	Pollution Control, Regulatory Services, Barnsley Metropolitan Borough Council
Contact:	Paul Denton, Environmental Health Officer
Consultation:	Email exchange regarding the noise survey and assessment methodology.

2.0 CRITERIA AND METHODOLOGY

Planning Policy

- 2.1 PPG24¹ which was previously referred to in relation to planning noise issues is no longer current following the publishing of the NPPF² and the NPPG³. There are no noise criteria figures quoted in the NPPF / NPPG and it has been left to local authorities to agree their own criteria.
- 2.2 Paragraph 170 of the NPPF states that "*Planning policies and decisions should contribute to and enhance the natural and local environment by*"..."*preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability*".
- 2.3 Paragraph 180 states that "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 sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:
- *mitigate and reduce to a minimum potential adverse impacts resulting from noise from the new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life*
 - *identify and protect tranquil which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
 - *(refers to light pollution which is not relevant to this report)*
- 2.4 Paragraph 180(a) quoted from above refers to the NPSE⁴ which sets out the Government's long term "Noise Policy Vision" as follows:
- *"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."*

2.5 Paragraph 182 states that "Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed".

2.6 The NPSE states that the above long-term vision is supported by the following "Noise Policy Aims":

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the Government policy on sustainable development:

- 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 The Explanatory Note to the NPSE gives further information on the meaning of the terms "significant adverse" and "adverse" in the above aims by using the following terms drawn from toxicology.

"NOEL - No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL - Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purposes of the NPSE leads to the concept of a significant observed adverse effect level.

SOAEL - Significant Observed Adverse Effect Level

This is the level above which significant effects on health and quality of life occur."

- 2.8 The NPSE does not quantify the above measures. In fact the explanatory note to the NPSE states that *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times"*.
- 2.9 The explanatory note to the NPSE indicates that the adoption of the policy should mean that noise is properly taken into account at the appropriate time and that opportunities for cost effective management are not missed through considering too late in the planning / design process. In addition the policy is intended to enable noise to be considered alongside other relevant issues rather than in isolation with adequate weight being given to the wider benefits of a development when assessing noise implications.
- 2.10 The NPPG also refers to the above terminology and states that:
Local planning authorities' plan-making and decision taking should take into account the acoustic environment and is doing so consider:
- *Whether or not a significant adverse effect is occurring or likely to occur;*
 - *Whether or not an adverse effect is occurring or likely to occur; and*
 - *Whether or not a good standard of amenity can be achieved."*
- 2.11 The following table is given in the NPPG to summarise the noise exposure hierarchy, based on likely average response.

Table 1: 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 behavior 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, e.g. 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, e.g. 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, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.12 The NPPG goes on to say that the noise impact depends not only on the absolute level of the noise but also on other factors such as the time of day it occurs; the intermittency and frequency of events and the spectral content of the noise. The NPPG recommends that consideration be given as to whether internal effects can be completely removed by closing windows and states that in that case alternative means of ventilation may be required. It also advises that the acoustic environment in external amenity areas be considered in the design.

2.13 When talking about noise mitigation the NPPG states that:

"In general, for noise making developments, there are four broad types of noise mitigation which can be considered:

- **engineering:** reducing the noise generated at source and/or containing the noise generated;
- **layout:** where possible, optimising the distance between the source and noise-sensitive receptors and/or incorporating good design to minimise noise transmission through the use of screening by natural or purpose built barriers, or other buildings;
- **using planning conditions/obligations** to restrict activities allowed on the site at certain times and/or specifying permissible noise levels differentiating as appropriate between different times of day, such as evenings and late at night, and;
- **mitigating** the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building.

For noise sensitive developments mitigation measures can include avoiding noisy locations; designing the development to reduce the impact of noise from the local environment; including noise barriers; and, optimising the sound insulation provided by the building envelope.”

2.14 The NPPG also gives the following advice in relation to mitigating the impact of noise on residential developments.

“the noise impact may be partially off-set if the residents of those dwellings have access to:

- a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling, and/or;
- a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or;
- a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or;
- a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquility) that is nearby (e.g. within a 5 minutes walking distance).”

2.15 The above is a summary of planning documents and is not intended to be exhaustive. Further information is available in the original documents.

Noise Criteria for General Noise Impact on Proposed Residential Sites

- 2.16 As PPG24¹ has been superseded and the replacement planning guidance has no numerical criteria there are no nationally recognised numerical noise criteria for assessing the suitability of sites for residential development. However, local planning authorities generally use noise criteria based on BS8233⁵.
- 2.17 The BS8233 recommendations for indoor ambient noise levels are given below.

Table 2: BS8233 recommendations for indoor ambient noise levels

Activity	Location	07:00 to 23:00 hrs	23:00 to 07:00 hrs
Resting	Living room	35 dBL _{Aeq,16hour}	-
Dining	Dining room/area	40 dBL _{Aeq,16hour}	-
Sleeping (daytime resting)	Bedroom	35 dBL _{Aeq,16hour}	30 dBL _{Aeq,8hour}

- 2.18 Although no specific numerical criterion is given for individual events in BS8233:2014, most local authorities require that noise from individual events during the night-time (23:00-07:00 hrs) should not regularly exceed 45 dBL_{Amax,f} in bedrooms.
- 2.19 Paragraph 7.7.3.2 of BS8233 recommends that for traditional external amenity areas such as gardens and patios, it is desirable that during the daytime the external noise level does not exceed 50 dBL_{Aeq,T} with an upper guideline value of 55 dBL_{Aeq,T} which would be acceptable in noisier environments. The time period is not stated but is assumed to be 16 hours (07:00 hours to 23:00 hrs) as in the previous version of BS8233.

ProPG: Planning & Noise

- 2.20 Additional guidance on noise issues in relation to the planning process for new residential developments can be found in ProPG: Planning and Noise⁶. This document has been issued jointly by the Association of Noise Consultants; the Institute of Acoustics and the Chartered Institute of Environmental Health. Two supplementary documents have also been issued.

- 2.21 ProPG emphasises the need for good acoustic design of residential developments and gives advice on how that can be achieved.
- 2.22 The ProPG documents refer to the planning standards and guidance given above, and the acoustic design criteria given in the document are mainly taken from BS8233⁵. In relation to the 45 dBL_{Amax,F} criterion in bedrooms at night (which is not given in BS8233) the ProPG advises that in most circumstances good acoustic design can be used so that individual noise events do not normally exceed 45 dBL_{Amax,F} more than 10 times a night.

3.0 NOISE SURVEY

- 3.1 A survey of the current noise levels at the site was carried out from the afternoon of Monday 28 October 2019 to the afternoon of Wednesday 30 October 2019 as summarised below. The noise monitoring locations are shown on Figure 3.

Table 3. Noise survey

Location A	
Microphone position	In freefield conditions above the fence at the rear of the yard to the southeast of the existing buildings approximately 16m north-east of the nearest train track at a height of 4m.
Sound level meter	Rion NL-52, Class 1, serial number: 00976253
Location B	
Microphone position	In freefield conditions above the gatepost at the front of the yard to the southeast of the existing buildings approximately 8m south of Station Road at a height of 2.5m.
Sound level meter	Rion NL-52, Class 1 serial number: 00732142
- All measurements were undertaken on an unattended basis and included 1/3 octave band frequency analysis. - All noise levels measured using 5-minute sample periods. - The sound level meters were calibrated at the start and finish of the surveys using a Norsonic 1251 portable calibrator, serial number: 32860. There was no calibration drift.	

- 3.2 Weather conditions when the site was visited to install and then retrieve the sound level meter were dry with low wind speeds (<5m/s). From weather reports it is understood that the weather conditions were generally dry with low wind speeds throughout most of the survey.
- 3.3 The noise survey results are summarised below, and the full results of the noise surveys are given in Appendix A2. Where required dB_{LAeq} values have been log-averaged.

Table 4. Results of unattended noise survey – freefield dB_{LAeq} noise levels.

Day	Period	Location A	Location B
Daytime			
Mon	17:00-23:00 hrs	57.6	62.0
Tues	07:00-23:00 hrs	57.4	63.7
Weds	07:00-15:00 hrs	58.0	63.6
Night-time			
Mon-Tues	23:00-07:00 hrs	54.9	54.5
Tues-Weds	23:00-07:00 hrs	54.0	54.1

- 3.4 The highest free-field $dB_{LAmax,5min}$ noise levels that were measured during the night-time (23:00-07:00 hrs) and the 5-minute periods during which they occurred are given below:

Table 5. Highest freefield night-time $dB_{LAmax,5min}$ noise levels at railside Location A Monday 28 Oct – Tuesday 29 Oct 2019

Rank	Start (h:m:s)	$LA_{max}(f)$
1	06:55:01	96.5
2	23:30:01	82.7
3	23:05:01	82.2
4	00:45:01	82.2
5	00:30:01	81.9
6	23:45:01	78.4
7	23:50:01	78.0
8	00:50:01	76.3
9	00:00:01	71.3
10	00:40:01	69.9

**Table 6. Highest freefield night-time $dB L_{Amax,5min}$ noise levels at railside Location A
Tuesday 29 Oct – Wednesday 30 Oct**

Rank	Start (h:m:s)	$L_{Amax}(f)$
1	05:30:01	93.9
2	23:45:01	85.0
3	23:20:01	84.9
4	23:10:01	82.7
5	00:45:01	82.1
6	00:20:01	81.9
7	00:50:01	76.1
8	00:10:01	70.3
9	06:50:01	69.0
10	06:45:01	63.2

**Table 7. Highest freefield night-time $dB L_{Amax,5min}$ noise levels at roadside Location B
Monday 28 Oct – Tuesday 29 Oct 2019**

Rank	Start (h:m:s)	$L_{Amax}(f)$
1	01:40:01	80.9
2	06:55:01	76.6
3	23:05:01	75.8
4	06:45:01	75.0
5	06:05:01	73.5
6	23:25:01	73.3
7	00:40:01	73.2
8	03:25:01	73.1
9	23:00:01	73.0
10	23:40:01	73.0
11	05:40:01	72.7
12	02:25:01	72.6

**Table 8. Highest freefield night-time $dB L_{Amax,5min}$ noise levels at roadside Location B
Tuesday 29 Oct – Wednesday 30 Oct**

Rank	Start (h:m:s)	$L_{Amax}(f)$
1	06:45:01	77.8
2	06:50:01	76.1
3	23:45:01	75.3
4	05:30:01	75.1
5	06:40:01	74.9
6	23:05:01	74.6
7	06:20:01	74.4
8	23:00:01	74.0
9	06:15:01	74.0
10	03:50:01	73.0
11	05:40:01	73.0
12	05:35:01	72.9

- 3.5 The main noise sources noted during the periods of attendance on site were road traffic to the front and rail to the rear. Rail timetables indicate that the passenger trains run from about 06:00 to midnight on weekdays. The line also carries occasional freight movements. An internet search indicates that there can be up to 5 or 6 freight movements scheduled to pass the site in each 24-hour period but normally the frequency is normally much lower with some days showing no movements or 1 movement. On days showing a higher frequency there are typically one or two movements scheduled during the night. Freight movement records indicate that there were 6 freight trains scheduled to pass the site during the survey period two of which were scheduled at night. The railside noise data is likely to be typical. The railside meter was fitted with audio recording but the audio settings resulted in only the highest maxima being audible. The two highest maxima sounded like freight loco pass-bys.

4.0 ASSESSMENT AND RECOMMENDATIONS

Assessment criteria

- 4.1 This assessment and recommendations have been based on the BS8233⁵ criteria given in Section 2.0 above. The criteria are as follows.

Living rooms and bedrooms 07:00 to 23:00 hours	35 dBL _{Aeq(16-hour)}
Bedrooms 23:00 to 07:00 hours	30 dBL _{Aeq(8-hour)} & 45 dBL _{Amax} (not to be regularly exceeded)
External amenity areas	55 dBL _{Aeq(16-hour)}

- 4.2 The Pro-PG⁶ advice on good acoustic design recommends that the 45 dBL_{Amax} criterion in bedrooms should not normally be exceeded more than 10 times a night. The calculations for the bedrooms closest to the road have been based on the third highest dBL_{Amax} reading recorded on the roadside meter. This is more onerous than the Pro-PG advice. The audio recording from the railside meter indicates that the highest maxima were caused by a train passby which is likely to have been a freight train. This is also supported by the frequency analysis. This report gives building envelope recommendations to control these highest maxima to meet the 45 dBL_{Aeq} criterion in bedrooms. The next highest maxima recorded each night on the railside meter were significantly lower (13.8 dB(A) lower on the first night and 8.9 dB(A) lower on the second night). It is likely that the 2nd highest and those below that were all caused by passenger trains and that there was only one freight pass-by each night. If the Environmental Health Officer is willing to accept assessment to the second highest maxima on each night, then the required building envelope specification could be reduced considerably but such a design would be likely to result in exceedance of the criterion during freight train pass-bys.
- 4.3 Building envelope recommendations to meet the above internal noise level criteria are given below. The recommendations have been based on the plan shown in Figure 2. Room layouts and elevation details are unknown at this stage and therefore the calculations have been based on assumed room and glazing sizes which should be checked at the detailed design stage.

External amenity areas

- 4.4 Monitoring Location B was representative of the nearest proposed garden positions to the road. The measured noise level at Location B was approaching 64 $\text{dBL}_{\text{Aeq},16\text{hrs}}$ which is well above the upper limit of 55 $\text{dBL}_{\text{Aeq},16\text{hrs}}$ recommended in BS8233 for external amenity areas. Therefore, acoustic barriers will be required along the roadside boundary of the gardens closest to the road. A 2m high acoustic barrier would provide attenuation of around 11 dB(A) at standing height in the closest gardens to the road and attenuation of around 13 dB(A) at seated positions. This will be sufficient to bring road traffic noise levels down to below the 55 dBL_{Aeq} criterion.
- 4.5 Monitoring Location A was closer to the rail than the nearest garden. The measured noise level at Location B was around 57 $\text{dBL}_{\text{Aeq},16\text{hrs}}$ which is slightly above the upper limit of 55 $\text{dBL}_{\text{Aeq},16\text{hrs}}$ recommended in BS8233 for external amenity areas. However, rail noise in the centre of the closest garden will be slightly less and this noise level is also influenced by road traffic noise coming across the site which will be reduced by the acoustic barriers proposed above. It is likely therefore that the noise levels in gardens to the rear of the site will be around the 55 dBL_{Aeq} criterion. It is not possible to screen the gardens from the rail with normal height acoustic barriers because it is on embankment. As the noise levels will be around the criterion and the rail noise is intermittent it is suggested that acoustic fences only be required to the roadside boundary.
- 4.6 Therefore, it is recommended that 2.0m high acoustic barriers be constructed between the proposed gardens and the road. The acoustic barriers may be close-boarded weather-treated timber fences (min 18-20mm thick) with cover strips over the gaps between panels and gravel boards to seal the gap at the base. Alternatively, masonry walls could be used.
- 4.7 It should also be noted that BS8233:2014 states:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 $\text{dBL}_{\text{Aeq},T}$, with an upper guideline value of 55 $\text{dBL}_{\text{Aeq},T}$, which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a

compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

External wall construction

- 4.8 This assessment has been based on cavity masonry external wall construction (e.g. brickwork outer leaf and solid dense blockwork inner leaf) which would provide sufficient sound insulation. Other external wall construction sections (e.g. timber frame, rainscreen cladding, etc.) should be checked with an acoustic consultant.

Roof construction

- 4.9 It has been assumed that the external roof construction of the properties will be roofing tiles on felt and that there will be no rooms in roof.
- 4.10 It is recommended that the internal plasterboard ceilings to the upper floor bedrooms be a minimum of 2 layers of 15mm dense plasterboard. A minimum of 100mm mineral wool insulation should be placed over the ceilings in the roof void/loft.

Ventilation and glazing

- 4.11 All living rooms in the properties closest to the road where there is a view of the road from the windows should be fitted with:
- Specialist acoustic vents with a minimum performance of 42 dB $D_{n,ew}$ when open.
 - Glazing with a minimum performance of 39 dB R_w .
- 4.12 All other living rooms should be fitted with:
- Specialist acoustic vents with a minimum performance of 40 dB $D_{n,ew}$ when open.
 - Glazing with a minimum performance of 31 dB R_w .

4.13 Bedrooms within 25m of the closest railway line should be fitted with:

- Specialist acoustic vents with a minimum performance of 55 dB $D_{n,ew}$ when open.
- Glazing with a minimum performance of 49 dB R_w .

4.14 Bedrooms more than 25m of the closest railway line should be fitted with:

- Specialist acoustic vents with a minimum performance of 55 dB $D_{n,ew}$ when open.
- Glazing with a minimum performance of 39 dB R_w .

4.15 Ventilation: The following additional points regarding ventilation should be noted:

- The dB $D_{n,ew}$ values given above for background ventilators are for vents in the open position.
- The recommended minimum acoustic ventilation performance figures given above are applicable where 1 vent is sufficient to provide adequate airflow within the room. If more than one vent is required, then the required performance for each individual vent must be increased by $10 \times \log(n)$ where n is the number of vents in the room. Please see Appendix A3 for more information.
- Examples of background ventilators are detailed in Appendix A3.
- Where acoustic vents are specified, they are to replace standard trickle vents and the rooms where enhanced acoustic vents are specified should not have standard trickle vents in the windows. Please note that window-frame vents are not suitable for use with secondary glazing.
- The recommendations given in this report are to achieve the internal noise criteria with windows closed. The ventilation strategy is beyond the scope of this report and advice should be obtained from a ventilation engineer.
- Ventilation is normally covered by Approved Document F to the Building Regulations (ADF) and the strategy normally needs to be approved by Building Control. This normally involves the provision of "Whole Dwelling Ventilation" (a low rate of ventilation previously called "background ventilation"); "Extract Ventilation" (passive stack or mechanical extract normally from wet areas) and "Purge Ventilation" (manually controlled rate ventilation to rapidly dilute pollutants or remove water vapour – normally by opening windows). If the chosen strategy involves extract by intermittent extract fans from wet areas or passive stack or continuous mechanical extract (MEV) then background ventilators will normally be required to provide inlet air. Where there is no noise intrusion issue these background ventilators are normally window head trickle vents. It is these window head trickle vents that must be replaced with enhanced acoustic vents in the areas where enhanced sound insulation is required. This is done either by installing enhanced acoustic window frame

vents instead of the normal trickle vents or by using through-the-wall acoustic vents (in which case the windows should be supplied without any window frame trickle vent slots). The other possible ventilation system is continuously running mechanical supply and extract with heat recovery (MVHR). This system involves fully ducted supply and extract and where it is installed there should be no background ventilators installed in the walls or the windows (i.e. the windows should be supplied without any window frame trickle vent slots).

- To satisfy the ADF requirement for purge ventilation it is normally necessary to have openable windows. This gives residents the option of opening windows occasionally when a high rate of air change is required (e.g. when food is burnt). During purge scenarios it is normally accepted that, in high noise environments, the internal noise criteria will not be met.
- Overheating is a growing concern and sometimes an enhanced level of airflow is requested over and above the ADF whole dwelling ventilation provisions to mitigate overheating. The calculation of the likelihood of overheating depends on a variety of factors such as the orientation, size and thermal properties of building envelope elements and it is beyond the scope of this report. If an enhanced level of airflow is required, then consideration could be given to the use of an MEV or an MVHR system with an enhanced level of airflow above the minimum requirement for ADF. The level of airflow would need to be determined by a ventilation engineer in consultation with the planning and building control officers and is beyond the scope of this report.
- If an MEV or MVHR system is used, it is preferable for the ductwork terminations to be on quiet facades if possible. Where this is not possible in duct attenuators may be required as part of the installation to mitigate the risk of noise transfer from outside to the living accommodation via the ventilation system. Where there is a very long length of ductwork between the room and the termination it is sometimes possible to avoid the use of in-line attenuators because of the losses that occur in the ductwork. However, the design of attenuators is beyond the scope of this report and would normally be carried out by the attenuator supply commissioned by the ventilation engineer.

4.16 Glazing: The following additional points regarding glazing should be noted:

- The minimum glazing performance dB R_w values given above should be met by the installed windows including the framing.
- Examples of possible glazing systems are given in Appendix A4 but these are indicative only and compliance should be confirmed by the manufacturer/installer.

- The windows installed (included the framing) should have manufacturer's test data confirming compliance with the dBR_w values indicated. The glass specification may need to be enhanced for other reasons (e.g. safety).
- All double-glazed units should be of good quality and should achieve a good seal when closed and a good seal to the surrounding masonry. If secondary glazing is used both the external and the secondary glazing should be well sealed when closed.

General Comments

- 4.17 The assessment calculations have been based on the indicative layout in Figure 2 and alterations to the layout may affect the calculated noise levels. The calculations have also been based on typical glazing areas and room sizes because internal floor plans and elevations for the properties are not available at this stage. Therefore, the recommendations provided above are indicative and should be checked at the detailed design stage.
- 4.18 Where dense plasterboard is referred to this means 15 mm thick boards with a minimum mass of 12.5 kg/m². Suitable dense plasterboards include British Gypsum SoundBloc; Knauf Soundshield and Siniat dBCheck.
- 4.19 Where mineral wool is mentioned in the text above examples of suitable products are Isover APR 1200 or URSA Acoustic roll or Rockwool Flexi.
- 4.20 The recommendations in this report are given for acoustic reasons only and advice on other matters should be obtained from other specialists. It is the Client's responsibility to check with the manufacturer that all products chosen are suitable for the proposed use. The safety implications of the installation of any products used should be checked by the contractor before use and appropriate systems of work put in place. Heavier products are often preferable from the acoustic point of view. However, where it is considered that appropriate safe systems of work cannot be implemented for such products then alternatives should be agreed in advance of construction.

Station Road, Darton

Proposed residential development

- 4.21 The recommendations provided in this report are based on the noise levels measured during the survey. The survey measurements are considered to be representative of the area although there may be some variation in noise levels due to local events, seasons etc.

5.0 CONCLUSIONS

- 5.1 This assessment relates to the potential impact of existing noise sources on the proposed external amenity areas and on the living rooms and bedrooms within the proposed houses. Paul Denton, Environmental Health Officer at Barnsley Metropolitan Borough Council was consulted in advance about the methodology for the noise survey and assessment.
- 5.2 Recommendations have been made for boundary treatment to the gardens near the road. With the measures in place it is expected that the noise levels in gardens will around or below the upper criterion for external amenity areas.
- 5.3 Recommendations have been made for the building envelope design of the proposed properties in order to control noise intrusion. With the measures in place it is predicted that noise intrusion will be controlled to meet the criteria agreed with the Local Authority.
- 5.4 The assessment is indicative because of the information available at this stage and the recommendations should be checked at the detailed design stage
- 5.5 Noise can be satisfactorily controlled by the design of the development and therefore it is recommended that planning permission for the residential development should not be refused on noise grounds.

6.0 REFERENCES

1. PPG24: Planning Policy Guidance 24, Department of the Environment, 1994.
2. Ministry of Housing, Communities and Local Government, July 2018. National Planning Policy Framework.
3. Ministry of Housing, Communities and Local Government, Planning Practice Guidance on noise (2014). Obtained from:
<https://www.gov.uk/guidance/noise--2> accessed 21/11/2019.
4. Noise Policy Statement for England (NPSE), DEFRA, March 2010.
5. BS8233: British Standard 8233, Guidance on sound insulation and noise reduction for buildings, BSI 2014.
6. ProPG: Planning and Noise. Professional Practice Guidance on Planning & Noise. New Residential Development, May 2017.
Supplementary Document 1. Planning & Noise Policy and Guidance, May 2017.
Supplementary Document 2. Good Acoustic Design, May 2017

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FIGURE 1: SITE LOCATION

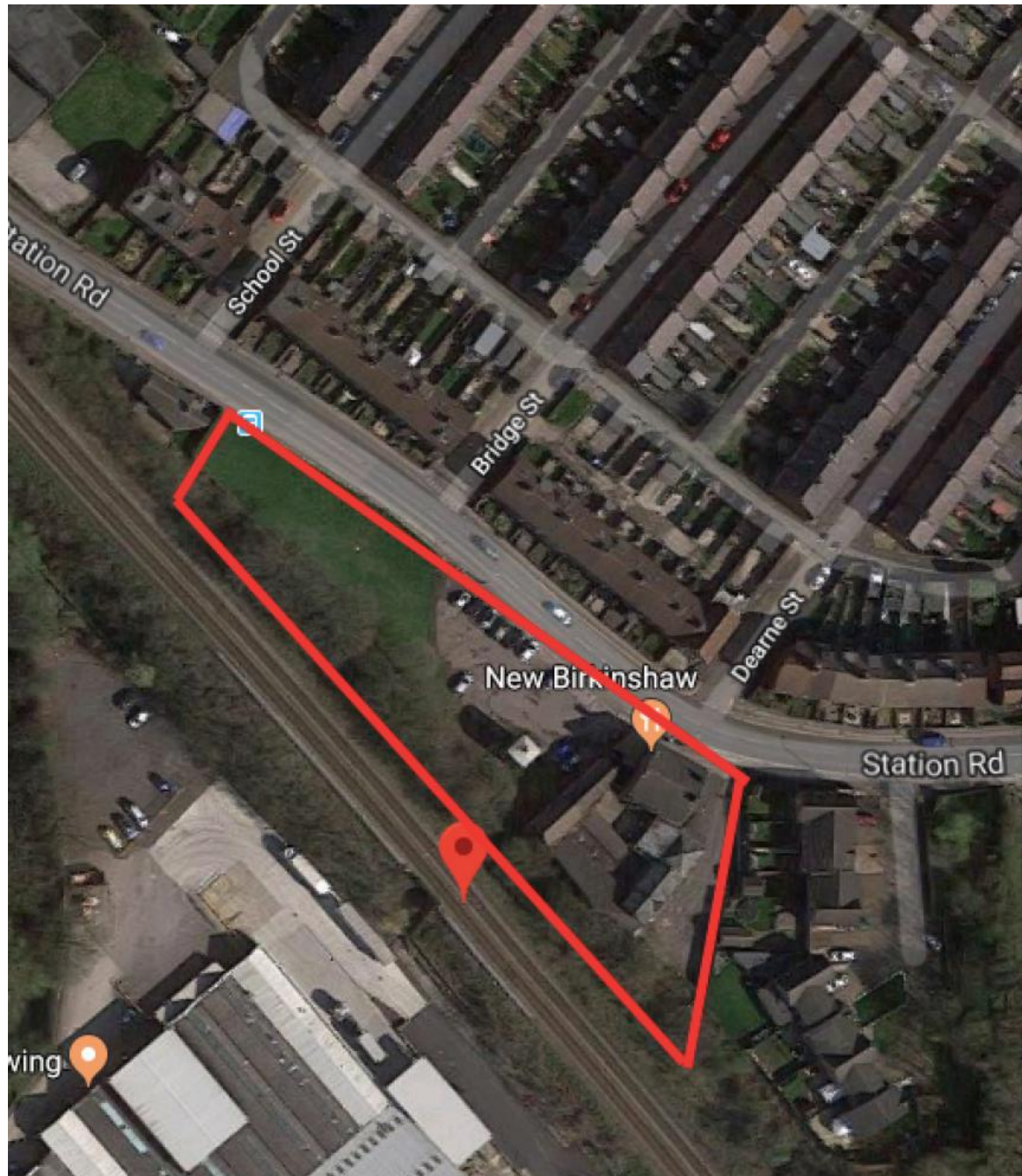
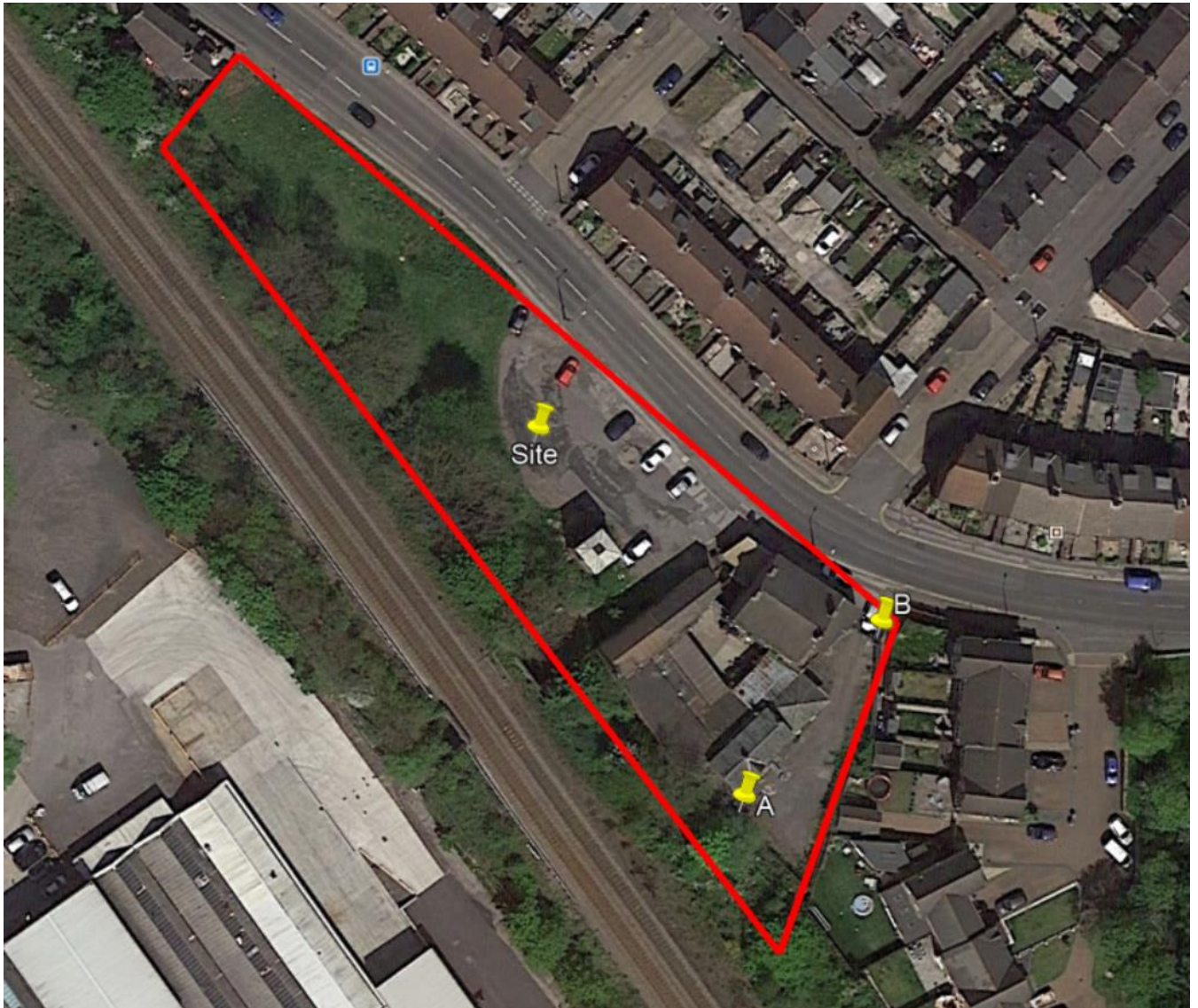


FIGURE 2: PROPOSED SITE LAYOUT

FIGURE 3: NOISE MONITORING LOCATIONS



APPENDIX A1: ACOUSTIC TERMINOLOGY

Ambient noise	The sound pressure level at a given location (i.e. sound from all sources) usually measured using the L_{Aeq} parameter.
A-weighting	A weighting applied to the frequencies which make up a sound pressure level to mimic the response of the human ear which is less responsive to low frequency sounds as it is to high frequency sounds. The resultant level after application of the weighting is called the 'A-weighted sound pressure level' and is denoted by dB(A) or by using a subscript A (e.g. dB_{LAeq}).
Background noise	The noise measured in the absence of the noise under investigation usually using the statistical parameter L_{90} which represents the quietest parts of the measurement period.
Broadband sound	Sound which contains all the frequencies.
Decibel (dB)	A logarithmic measurement scale used for sound pressure levels. This scale is used because the simple use of sound pressures would be unwieldy as the range of pressures to which the human ear responds is very large. The normal threshold of hearing at 1kHz is 0dB. A level of $120dB_{LAeq}$ is very loud (L signifies level and the A and eq are explained under A-weighting and L_{eq}). Some night club dance floors can have sound levels of around $110 dB_{LAeq}$. In the workplace the wearing of hearing protection is compulsory for staff who experience a noise level of over $85dB_{LAeq}$ averaged over an 8-hour day and is normally used when the levels are over $80dB_{LAeq}$ averaged over the 8-hour day. Noise intrusion levels into bedrooms (e.g. from traffic noise) are often controlled to below $30dB_{LAeq}$ in the design of new properties (standards sometimes vary between authorities). Noise levels of below $20dB_{LAeq}$ are very quiet and would normally only be achieved in a well designed recording studio. Although noise calculations are normally carried out using figures to 1 decimal place the results are often presented to the nearest dB as changes of a fraction of a dB are not normally perceptible even in controlled conditions.
Facade noise level	Noise level including a contribution from the reflection from a building facade, usually measured at 1m from the facade.
Free field	Noise levels with no contribution from reflections from nearby structures.
Hertz	The units used for frequency denoted by Hz, i.e. the number of cycles of pressure fluctuation per second. K used in front of Hz represents 1000 (1kHz = 1000Hz). High frequency sounds (e.g. 8kHz) are high pitched and low frequency sounds (e.g. 63Hz) are the bass notes.

L _{eq}	A parameter used to denote the 'equivalent continuous sound pressure level'. This is the sound pressure level of a continuous sound that would contain the same energy as the varying sound being measured or investigated. L _{Aeq} is the parameter used to denote the 'A-weighted equivalent continuous sound pressure level' (see A-weighting).
L ₁₀	A statistical parameter often used for the measurement of road traffic noise. It is the level exceeded for 10% of the time period being considered. If A-weighted a subscript A is included and the time period can also be included in subscript, e.g. L _{A10, 1hour} .
L ₉₀	A statistical parameter often used for the measurement of background noise levels. It is the level exceeded for 90% of the time period being considered. If A-weighted a subscript A is included and the time period can also be included in subscript, e.g. L _{A90, 5min} .
L _{max}	The maximum noise level which occurred during the monitoring period. L _{Amax,f} denotes the maximum A-weighted sound pressure level using the fast time constant of 125ms.
Loudness	Although a 3dB increase is equivalent to a doubling of the sound power level of a sound source this increase is the minimum perceptible under normal conditions. It takes a 10dB change in noise level for it to sound roughly twice (or half) as loud subjectively.

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APPENDIX A2: NOISE SURVEY RESULTS

Daytime Survey Data: Location A**Table A1: Railside Daytime Noise Survey Data
Monday 28 Oct 2019**

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
28/10/2019	17:00:01	01:00:00	58.3	83.8	51.4
28/10/2019	18:00:01	01:00:00	57.4	81.3	51.8
28/10/2019	19:00:01	01:00:00	57.5	82.2	50.9
28/10/2019	20:00:01	01:00:00	58.0	83.2	51.4
28/10/2019	21:00:01	01:00:00	56.4	82.4	51.1
28/10/2019	22:00:01	01:00:00	58.0	84.4	49.6
AVERAGE			57.6	-	51.0
HIGHEST			58.3	84.4	51.8
LOWEST			56.4	81.3	49.6

**Table A2: Railside Daytime Noise Survey Data
Tuesday 29 Oct 2019**

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
29/10/2019	07:00:01	01:00:00	59.5	87.0	54.8
29/10/2019	08:00:01	01:00:00	58.8	85.0	55.2
29/10/2019	09:00:01	01:00:00	57.1	81.2	53.2
29/10/2019	10:00:01	01:00:00	56.9	81.8	49.3
29/10/2019	11:00:01	01:00:00	55.7	80.1	47.5
29/10/2019	12:00:01	01:00:00	59.2	86.1	46.0
29/10/2019	13:00:01	01:00:00	57.2	83.8	46.4
29/10/2019	14:00:01	01:00:00	57.9	85.8	46.7
29/10/2019	15:00:01	01:00:00	56.9	82.2	46.2
29/10/2019	16:00:01	01:00:00	57.4	82.9	46.1
29/10/2019	17:00:01	01:00:00	57.5	84.6	47.5
29/10/2019	18:00:01	01:00:00	56.5	84.6	47.5
29/10/2019	19:00:01	01:00:00	56.6	84.8	45.2
29/10/2019	20:00:01	01:00:00	57.8	84.3	42.9
29/10/2019	21:00:01	01:00:00	55.9	81.9	42.0
29/10/2019	22:00:01	01:00:00	55.6	82.0	43.5
AVERAGE			57.4	-	47.5
HIGHEST			59.5	87.0	55.2
LOWEST			55.6	80.1	42.0

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Table A3: Railside Daytime Noise Survey Data
Wednesday 30 Oct 2019

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
30/10/2019	07:00:01	01:00:00	55.7	79.7	50.8
30/10/2019	08:00:01	01:00:00	59.4	87.3	52.2
30/10/2019	09:00:01	01:00:00	57.9	83.8	49.3
30/10/2019	10:00:01	01:00:00	58.5	85.8	47.3
30/10/2019	11:00:01	01:00:00	57.6	81.7	45.9
30/10/2019	12:00:01	01:00:00	56.6	81.7	46.1
30/10/2019	13:00:01	01:00:00	58.1	82.9	46.5
30/10/2019	14:00:01	01:00:00	59.1	87.6	45.6
AVERAGE			58.0	-	48.0
HIGHEST			59.4	87.6	52.2
LOWEST			55.7	79.7	45.6

Daytime Survey Data: Location B**Table A4: Roadside Daytime Noise Survey Data
Monday 28 Oct 2019**

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
28/10/2019	17:00:01	01:00:00	63.5	85.8	52.3
28/10/2019	18:00:01	01:00:00	63.9	76.6	53.9
28/10/2019	19:00:01	01:00:00	62.3	76.1	49.7
28/10/2019	20:00:01	01:00:00	61.3	84.8	49.4
28/10/2019	21:00:01	01:00:00	59.3	75.2	47.9
28/10/2019	22:00:01	01:00:00	59.5	88.8	46.6
AVERAGE			62.0	-	50.0
HIGHEST			63.9	88.8	53.9
LOWEST			59.3	75.2	46.6

**Table A5: Roadside Daytime Noise Survey Data
Tuesday 29 Oct 2019**

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
29/10/2019	07:00:01	01:00:00	63.9	92.7	51.8
29/10/2019	08:00:01	01:00:00	63.5	81.1	53.1
29/10/2019	09:00:01	01:00:00	63.1	78.5	51.5
29/10/2019	10:00:01	01:00:00	63.1	77.6	49.6
29/10/2019	11:00:01	01:00:00	62.9	80.0	50.0
29/10/2019	12:00:01	01:00:00	69.5	101.4	48.6
29/10/2019	13:00:01	01:00:00	62.3	78.1	49.1
29/10/2019	14:00:01	01:00:00	64.2	95.1	49.9
29/10/2019	15:00:01	01:00:00	64.1	90.0	50.3
29/10/2019	16:00:01	01:00:00	62.9	85.9	48.9
29/10/2019	17:00:01	01:00:00	63.7	79.1	52.4
29/10/2019	18:00:01	01:00:00	63.6	75.8	52.4
29/10/2019	19:00:01	01:00:00	62.5	78.2	48.3
29/10/2019	20:00:01	01:00:00	60.9	74.1	44.1
29/10/2019	21:00:01	01:00:00	59.9	75.4	40.9
29/10/2019	22:00:01	01:00:00	59.0	81.4	41.9
AVERAGE			63.7	-	48.9
HIGHEST			69.5	101.4	53.1
LOWEST			59.0	74.1	40.9

Table A6: Roadside Daytime Noise Survey Data
Wednesday 30 Oct 2019

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
30/10/2019	07:00:01	01:00:00	62.1	82.9	48.3
30/10/2019	08:00:01	01:00:00	63.5	82.5	51.4
30/10/2019	09:00:01	01:00:00	63.0	78.7	50.1
30/10/2019	10:00:01	01:00:00	63.4	87.0	50.1
30/10/2019	11:00:01	01:00:00	63.0	86.7	48.8
30/10/2019	12:00:01	01:00:00	62.2	76.5	48.7
30/10/2019	13:00:01	01:00:00	66.8	98.8	49.2
30/10/2019	14:00:01	01:00:00	62.3	77.3	49.1
AVERAGE			63.6	-	49.5
HIGHEST			66.8	98.8	51.4
LOWEST			62.1	76.5	48.3

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Night-time Survey Data: Location A**Table A7: Railside Night time Noise Survey Data****Monday 28 Oct 2019 to Tuesday 29 Oct 2019**

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
28/10/2019	23:00:01	00:15:00	57.1	82.2	50.4
28/10/2019	23:15:01	00:15:00	51.9	58.0	49.3
28/10/2019	23:30:01	00:15:00	59.5	82.7	50.0
28/10/2019	23:45:01	00:15:00	53.9	78.4	48.9
29/10/2019	00:00:01	00:15:00	52.8	71.3	48.7
29/10/2019	00:15:01	00:15:00	50.6	57.1	47.6
29/10/2019	00:30:01	00:15:00	57.7	81.9	46.2
29/10/2019	00:45:01	00:15:00	57.6	82.2	46.6
29/10/2019	01:00:01	00:15:00	50.3	57.2	46.8
29/10/2019	01:15:01	00:15:00	48.2	55.1	45.2
29/10/2019	01:30:01	00:15:00	51.1	66.4	46.0
29/10/2019	01:45:01	00:15:00	48.0	54.9	44.3
29/10/2019	02:00:01	00:15:00	46.9	58.3	43.4
29/10/2019	02:15:01	00:15:00	48.3	55.7	44.6
29/10/2019	02:30:01	00:15:00	47.2	54.0	43.9
29/10/2019	02:45:01	00:15:00	49.1	58.7	45.3
29/10/2019	03:00:01	00:15:00	49.9	56.7	45.5
29/10/2019	03:15:01	00:15:00	48.7	55.4	45.1
29/10/2019	03:30:01	00:15:00	48.9	54.7	45.6
29/10/2019	03:45:01	00:15:00	49.2	58.0	45.4
29/10/2019	04:00:01	00:15:00	49.5	56.2	44.9
29/10/2019	04:15:01	00:15:00	49.7	57.6	45.5
29/10/2019	04:30:01	00:15:00	49.1	56.0	45.3
29/10/2019	04:45:01	00:15:00	49.7	56.7	44.8
29/10/2019	05:00:01	00:15:00	49.6	57.0	45.6
29/10/2019	05:15:01	00:15:00	49.0	57.1	45.1
29/10/2019	05:30:01	00:15:00	51.2	58.8	48.2
29/10/2019	05:45:01	00:15:00	51.1	61.0	47.9
29/10/2019	06:00:01	00:15:00	51.9	60.7	49.5
29/10/2019	06:15:01	00:15:00	53.4	58.2	51.5
29/10/2019	06:30:01	00:15:00	54.4	60.3	52.4
29/10/2019	06:45:01	00:15:00	66.3	96.5	52.3
AVERAGE			54.9	-	46.9
HIGHEST			66.3	96.5	52.4
LOWEST			46.9	54.0	43.4

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Table A8: Railside Night time Noise Survey Data
Tuesday 29 Oct 2019 to Wednesday 30 Oct 2019

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
29/10/2019	23:00:01	00:15:00	56.4	82.7	45.1
29/10/2019	23:15:01	00:15:00	59.6	84.9	43.6
29/10/2019	23:30:01	00:15:00	47.3	62.4	43.3
29/10/2019	23:45:01	00:15:00	57.7	85.0	43.1
30/10/2019	00:00:01	00:15:00	50.6	70.3	44.2
30/10/2019	00:15:01	00:15:00	56.6	81.9	43.0
30/10/2019	00:30:01	00:15:00	46.5	57.2	43.1
30/10/2019	00:45:01	00:15:00	57.8	82.1	42.5
30/10/2019	01:00:01	00:15:00	45.5	53.9	42.1
30/10/2019	01:15:01	00:15:00	47.0	56.5	44.0
30/10/2019	01:30:01	00:15:00	46.5	53.9	42.6
30/10/2019	01:45:01	00:15:00	48.2	55.5	44.2
30/10/2019	02:00:01	00:15:00	47.7	54.7	42.5
30/10/2019	02:15:01	00:15:00	46.4	55.3	42.8
30/10/2019	02:30:01	00:15:00	46.2	53.1	43.2
30/10/2019	02:45:01	00:15:00	45.0	51.2	41.2
30/10/2019	03:00:01	00:15:00	46.1	54.2	40.8
30/10/2019	03:15:01	00:15:00	48.6	55.6	44.0
30/10/2019	03:30:01	00:15:00	45.7	55.7	42.2
30/10/2019	03:45:01	00:15:00	45.7	57.1	41.3
30/10/2019	04:00:01	00:15:00	44.5	53.3	41.5
30/10/2019	04:15:01	00:15:00	45.9	55.0	42.5
30/10/2019	04:30:01	00:15:00	46.1	52.0	42.6
30/10/2019	04:45:01	00:15:00	45.5	51.3	42.2
30/10/2019	05:00:01	00:15:00	46.9	54.8	43.9
30/10/2019	05:15:01	00:15:00	47.3	59.0	43.7
30/10/2019	05:30:01	00:15:00	65.5	93.9	43.5
30/10/2019	05:45:01	00:15:00	46.9	57.2	43.2
30/10/2019	06:00:01	00:15:00	48.6	59.9	45.7
30/10/2019	06:15:01	00:15:00	50.8	57.2	48.6
30/10/2019	06:30:01	00:15:00	51.3	60.7	48.8
30/10/2019	06:45:01	00:15:00	52.3	69.0	49.3
AVERAGE			54.0	-	43.6
HIGHEST			65.5	93.9	49.3
LOWEST			44.5	51.2	40.8

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Night-time Survey Data: Location B**Table A9: Roadside Night time Noise Survey Data**
Monday 28 Oct 2019 to Tuesday 29 Oct 2019

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
28/10/2019	23:00:01	00:15:00	60.9	75.8	47.7
28/10/2019	23:15:01	00:15:00	57.0	73.3	45.8
28/10/2019	23:30:01	00:15:00	56.1	73.0	45.9
28/10/2019	23:45:01	00:15:00	53.7	70.4	44.6
29/10/2019	00:00:01	00:15:00	54.0	71.4	44.8
29/10/2019	00:15:01	00:15:00	53.6	72.0	43.7
29/10/2019	00:30:01	00:15:00	53.4	73.2	42.4
29/10/2019	00:45:01	00:15:00	51.9	70.8	42.8
29/10/2019	01:00:01	00:15:00	56.7	72.2	43.5
29/10/2019	01:15:01	00:15:00	53.3	72.0	41.9
29/10/2019	01:30:01	00:15:00	57.6	80.9	42.4
29/10/2019	01:45:01	00:15:00	50.8	70.1	40.7
29/10/2019	02:00:01	00:15:00	49.7	71.1	40.1
29/10/2019	02:15:01	00:15:00	47.4	72.6	41.2
29/10/2019	02:30:01	00:15:00	47.3	67.7	40.3
29/10/2019	02:45:01	00:15:00	48.1	70.4	41.5
29/10/2019	03:00:01	00:15:00	47.2	69.0	42.0
29/10/2019	03:15:01	00:15:00	50.1	73.1	41.4
29/10/2019	03:30:01	00:15:00	48.7	69.6	42.1
29/10/2019	03:45:01	00:15:00	45.1	52.5	42.1
29/10/2019	04:00:01	00:15:00	46.1	67.2	41.4
29/10/2019	04:15:01	00:15:00	50.7	70.6	42.2
29/10/2019	04:30:01	00:15:00	48.1	70.6	41.5
29/10/2019	04:45:01	00:15:00	50.4	72.5	41.2
29/10/2019	05:00:01	00:15:00	49.2	70.3	41.7
29/10/2019	05:15:01	00:15:00	50.4	71.1	41.6
29/10/2019	05:30:01	00:15:00	52.3	72.7	44.2
29/10/2019	05:45:01	00:15:00	52.6	71.4	43.8
29/10/2019	06:00:01	00:15:00	55.9	73.5	45.9
29/10/2019	06:15:01	00:15:00	57.4	72.5	47.9
29/10/2019	06:30:01	00:15:00	60.3	71.8	49.1
29/10/2019	06:45:01	00:15:00	60.1	76.6	48.7
AVERAGE			54.5	-	43.3
HIGHEST			60.9	80.9	49.1
LOWEST			45.1	52.5	40.1

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Table A10: Roadside Night time Noise Survey Data
Tuesday 29 Oct 2019 to Wednesday 30 Oct 2019

Date	Start (h:m:s)	Period (h:m:s)	Free field noise levels (dB)		
			L_{Aeq}	$L_{Amax(f)}$	L_{A90}
29/10/2019	23:00:01	00:15:00	60.9	74.6	42.7
29/10/2019	23:15:01	00:15:00	57.0	72.5	40.5
29/10/2019	23:30:01	00:15:00	54.8	71.4	39.9
29/10/2019	23:45:01	00:15:00	55.3	75.3	39.8
30/10/2019	00:00:01	00:15:00	55.9	72.1	41.2
30/10/2019	00:15:01	00:15:00	56.1	71.4	40.2
30/10/2019	00:30:01	00:15:00	54.3	72.6	39.6
30/10/2019	00:45:01	00:15:00	49.2	68.7	39.4
30/10/2019	01:00:01	00:15:00	49.8	69.3	38.6
30/10/2019	01:15:01	00:15:00	51.3	72.4	40.1
30/10/2019	01:30:01	00:15:00	46.5	70.2	39.2
30/10/2019	01:45:01	00:15:00	46.7	68.9	39.9
30/10/2019	02:00:01	00:15:00	47.1	69.3	39.1
30/10/2019	02:15:01	00:15:00	48.3	68.6	39.1
30/10/2019	02:30:01	00:15:00	45.1	69.1	39.7
30/10/2019	02:45:01	00:15:00	41.6	48.6	38.3
30/10/2019	03:00:01	00:15:00	42.4	54.2	37.7
30/10/2019	03:15:01	00:15:00	50.5	71.1	40.5
30/10/2019	03:30:01	00:15:00	48.4	71.1	38.3
30/10/2019	03:45:01	00:15:00	50.0	73.0	37.1
30/10/2019	04:00:01	00:15:00	44.9	67.2	38.2
30/10/2019	04:15:01	00:15:00	49.7	71.1	38.7
30/10/2019	04:30:01	00:15:00	44.5	68.3	38.9
30/10/2019	04:45:01	00:15:00	45.8	66.9	38.4
30/10/2019	05:00:01	00:15:00	50.8	71.7	39.8
30/10/2019	05:15:01	00:15:00	51.3	71.5	39.7
30/10/2019	05:30:01	00:15:00	54.4	75.1	39.5
30/10/2019	05:45:01	00:15:00	53.1	71.5	40.4
30/10/2019	06:00:01	00:15:00	55.4	71.8	42.1
30/10/2019	06:15:01	00:15:00	58.7	74.4	44.6
30/10/2019	06:30:01	00:15:00	59.0	74.9	45.4
30/10/2019	06:45:01	00:15:00	60.4	77.8	46.0
AVERAGE			54.1	-	40.1
HIGHEST			60.9	77.8	46.0
LOWEST			41.6	48.6	37.1

APPENDIX A3: VENTILATION SYSTEMS

The noise break-in calculations have been based on manufacturers' published test data for the ventilation units in the tables below:

Manufacturers' published sound insulation performance: Window frame vents

dB $D_{n,e,w}$	Ventilation unit
40	Titon SF3300 vent & 75mm spacer inside with SF Canopy & 50mm spacer-11mm outside / open
40	Passivent ALdB450 acoustic window vent inside with Fresh 65 outside
41	Titon SFSA acoustic V75 C50 / open
42	Passivent ALdB800 acoustic window vent inside with Fresh 65 outside
42	Renson Acoustic window ventilator Invisivent Evo AK Ultra / Open
42	Greenwood EAR42W Acoustic Window Ventilator
48	Renson Acoustic window ventilator Invisivent Evo AK EXTREME / Open

Manufacturers' published sound insulation performance: Through the wall vents

dB $D_{n,e,w}$	Ventilation unit
40	Rytons TAL9HMCWL - OPEN - ventilator assembly; x1 MFAB, TAL9x9 AirLiner1, HM123F Internal, ABC9 Cowl
42	Titon 9x6 Cowled Acoustic AirLiner® Set with Flush Louvre Ventilator
42	Rytons TALHMCWL - OPEN - ventilator assembly; x1 MFAB96, TAL8000 AirLiner, HM85F Internal, ABC6 Cowl
46	Greenwood AAB Acoustic Airbrick - Acoustic background ventilator
55	Greenwood MA3051 Acoustic wall ventilator
55	Titon Sonair F+ - Acoustic wall ventilator (active)

Other ventilation units from other manufacturers are available. However, it should be noted that not all units advertised as having the $D_{n,e,w}$ value(s) outlined as necessary in this report will provide the required attenuation at all frequencies. Ventilation units other than those listed above will need to be checked by an acoustic consultant. Selection should be based on $D_{n,e,w}$ values achieved with vents in the OPEN position.

The specified ventilation sound insulation performance applies to the combined sound insulation of all vents in the room. If only one vent is required, it can be selected with the specified performance given. If more than one vent is required, then the required performance for each individual vent must be increased by $10\log(n)$ where n is the number of vents in the room. For instance, if there are 2 vents to a room for which a 42 dB $D_{n,e,w}$ vent is specified, the required sound insulation performance for each individual vent must be increased to 45 dB $D_{n,e,w}$.

Links to the above suppliers' websites are given below:

- <http://www.greenwood.co.uk/range/15/acoustic-vents.html>
- http://www.passivent.com/acoustic_vents.html
- <http://www.titon.co.uk/pages/knowledge-support/acoustic-ventilation.php>
- <http://www.rensonuk.net/united-kingdom-acoustic-vent-sonovent.html>
- <http://rts.vents.co.uk/blog/index.php/approvals-testing/about-the-bre/#.VWzExM9VhBc>

APPENDIX A4: GLAZING SYSTEMS

Examples of potential glazing systems are given below:

dB R _w	Indicative specification
31	Double glazed units comprising two panes of 4mm or 6mm glass separated by a 12mm cavity.
33	Double glazed units comprising two panes of 6mm glass separated by a 12mm cavity.
34	Double glazed units comprising one pane of 6mm glass and one pane of 4mm glass separated by a 12mm cavity.
35	Double glazed units comprising one pane of 10mm glass and one pane of 4mm glass separated by a 12mm cavity. Alternatively, double glazed units comprising one pane of 8mm glass and one pane of 6mm glass separated by a 12mm cavity.
37	Double glazed units comprising one pane of 10mm glass and one pane of 6mm glass separated by a 12mm cavity.
39	Double glazed units comprising one pane of 10mm glass and one pane of 6.4mm pvb laminated glass separated by a 12mm cavity.
41	Double glazed units comprising one pane of 10.4mm acoustic laminated glass and one pane of 6.4mm acoustic laminated glass separated by a 12mm cavity.
43	Double glazed units comprising one pane of 10.8mm acoustic laminated glass and one pane of 8.4mm acoustic laminated glass separated by a 12mm cavity.
45	Double glazed units comprising one pane of 10.8mm acoustic laminated glass and one pane of 8.8mm acoustic laminated glass separated by a 12mm cavity.
46	External single glazing (min 4mm) or a thermal double-glazed unit plus additional 6mm secondary glazing in a separate frame with a minimum cavity of 100mm (glass to glass).
47	External single glazing (min 4mm) or a thermal double-glazed unit plus additional 6mm secondary glazing in a separate frame with a minimum cavity of 150mm (glass to glass).
49	External single glazing (min 10mm) or a 10mm glass / 12mm cavity / 4mm glass double-glazed unit plus additional 6mm secondary glazing in a separate frame with a minimum cavity of 200mm (glass to glass).
52	External 13mm acoustic laminated glass / 10mm cavity / 6mm glass double-glazed unit plus additional 6mm secondary glazing in a separate frame with a minimum cavity of 200mm (glass to glass).

Note: the above examples are indicative only and the installed glazing systems used should meet the required dB R_w values including framing and compliance should be confirmed by the manufacturer / installer.

The stated 12mm cavity in the double-glazed systems can normally be varied from around 10mm to 20mm with little effect on the sound insulation performance but this should be checked with the manufacturer.

The above specifications may need to be increased for other reasons non-acoustic (e.g. safety). All glazing units (primary and secondary) must achieve a good seal when closed and there must be a good seal between the framing and the walls.