

RESIDENTIAL DEVELOPMENT ON LAND OFF DON STREET, MIDDLETON

NOISE & VIBRATION ASSESSMENT

On behalf of:
Kellen Homes Limited

RESIDENTIAL DEVELOPMENT ON LAND OFF DON STREET, MIDDLETON
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CONTENTS

1.0	INTRODUCTION	1
2.0	GUIDANCE AND ACOUSTIC DESIGN CRITERIA	2
3.0	NOISE SURVEY	10
4.0	RAILWAY VIBRATION SURVEY & ASSESSMENT	13
5.0	NOISE ASSESSMENT	14
6.0	RECOMMENDED NOISE MITIGATION SCHEME & CONCLUSION	18
7.0	SUMMARY	21
	FIGURE 1 – SITE LOCATION & NOISE MEASUREMENT POSITIONS	22
	FIGURE 2 – PROPOSED SITE LAYOUT & NOISE MITIGATION SCHEME	23
	APPENDIX I: NOISE UNITS & INDICES	24
	APPENDIX II: NOISE SURVEY RESULTS	26

1.0 INTRODUCTION

- 1.1 Hepworth Acoustics Ltd was commissioned by Kellen Homes Limited to carry out an assessment of the impact of existing noise sources on a proposed residential development on land off Don Street, Middleton. The noise assessment is required in connection with a proposed planning application for the development.
- 1.2 The location of the proposed residential development, which is currently unused land, is shown in Figure 1. The site is formed of three parcels of land. There are two parcels located on either side of Don Street and the third is located further south. The River Irk runs through the centre of the site. To the southwest (on the other side of the river) is the 'Vitafoam Works' with associated service yards overlooking the development site. Further east is Hexpol TPE 'plastic works'. The development site is bounded to the north by existing dwellings with Oldham Road just beyond. The development is set back from Oldham Road and screened by the existing dwellings and therefore road traffic noise is not considered any further for this development. The Caldervale railway line runs along the eastern boundary of the site and is elevated above the ground level of the development land.
- 1.3 It is proposed to develop the site for residential use with 364 dwellings consisting of a mixture of detached, semi-detached and terraced houses. Vehicular access to the development will be via Don Street to the centre of the site and Oldham Road to the south. The assessment has been based on the layout shown on drawing KH/DS/CP/B1, as provided by Kellen Homes. The proposed layout of the development is shown in Figure 2.
- 1.4 The assessment of noise and vibration has included:
- An inspection of the site and surrounding area.
 - Measurement of noise and any ground vibration from the railway.
 - Measurement of any noise from nearby industrial/commercial premises.
 - Assessment of potential noise or ground vibration impact on the proposed development.
 - Recommendation of an appropriate noise mitigation scheme.
- 1.5 The various noise units and indices referred to in this report are described in Appendix I. All noise levels mentioned in the text have been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 GUIDANCE AND ACOUSTIC DESIGN CRITERIA

NPPF:2019

- 2.1 Paragraph 185 of the National Planning Policy Framework (NPPF) 2021 states that planning policies and decisions should *“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 doing so they should: a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;”*
- 2.2 A requirement of Paragraph 187 of the NPPF is that new development can be integrated effectively with existing businesses. Existing businesses 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 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. Thus, for this development, if it is found that there is adverse noise impact from the existing commercial/industrial premises it is incumbent on the housing developer to incorporate adequate noise mitigation into the residential developer to protect the amenity of the new residents but also to safeguard the business interests of the commercial operator.

NPSE:2010

- 2.3 The Noise Policy Statement for England (NPSE) 2010, which is referred to in the NPPF, includes three aims:
- i. Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
 - ii. Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

- iii. Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

BS 4142:2014+A1:2019

- 2.4 British Standard 4142:2014+A1:2019, 'Methods for rating and assessing industrial and commercial sound' is the appropriate guidance for assessing the potential noise impact at residential locations from commercial and industrial sources.
- 2.5 BS 4142 requires a 'rating' level ($L_{Ar,Tr}$) calculated from the operation of the noise source to be compared with the background sound level ($L_{A90,T}$) which is measured in the absence of the noise source. The noise is evaluated over a 1-hour period for daytime operations (07:00 - 23:00 hours) and 15-minute period for night-time operations (23:00 - 07:00 hours).
- 2.6 The rating level ($L_{Ar,Tr}$) is based on the 'specific' sound level ($L_{Aeq,Tr}$) attributed to the operating noise source, with 'character corrections' added for sound sources where 'certain acoustic features can increase the significance of impact'.
- 2.7 The acoustic character correction applied to the specific sound level in order to obtain the rating level can take into account tonality, intermittency, impulsivity and characteristics otherwise distinctive against the prevailing noise climate in the area.
- 2.8 An initial estimate of the potential noise impact from the operating noise source is determined by comparing the difference between the background level and the rating level.
- 2.9 Regarding the outcome of the initial estimate, BS 4142 states that:
 - Typically, the greater this difference, the greater the magnitude of impact;
 - A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
 - A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and,
 - The lower the rating level is relative to the measured background level, the less likely it is that the operation will have an adverse impact or a significant adverse impact. Where the rating level is does not exceed the background sound level, this is an indication of the specific sound source having low impact, depending on the context.

- 2.10 BS 4142 also states in respect of background sound levels that *“it is important to ensure that values are reliable and suitably represent the particular circumstances and periods of interest... the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods”*.
- 2.11 BS 4142 states that all pertinent factors must be taken into account regarding the context in which the noise occurs, including but not limited to:
- The absolute level of sound.
 - The character and level of the residual sound compared to the character of the specific sound; and,
 - The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will incorporate design measures that ensure good internal and/or outdoor acoustic conditions such as acoustic screening.
- 2.12 The initial numerical assessment and the context are then both taken into account when determining the potential noise impact.

BS 8233:2014

- 2.13 No specific guidance is given in the NPPF on acoustic design criteria, therefore, the guidance discussed below has been used for acoustic design purposes.
- 2.14 Guidance on acceptable noise levels in habitable rooms and private gardens is set out in British Standard 8233: 2014, ‘Guidance on sound insulation and noise reduction for buildings’, which carries the full weight of an adopted British Standard. BS 8233 recommends that it is desirable that noise from external sources does not exceed the guidelines values that are shown in Table 1 inside habitable rooms for daytime (07:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) periods.

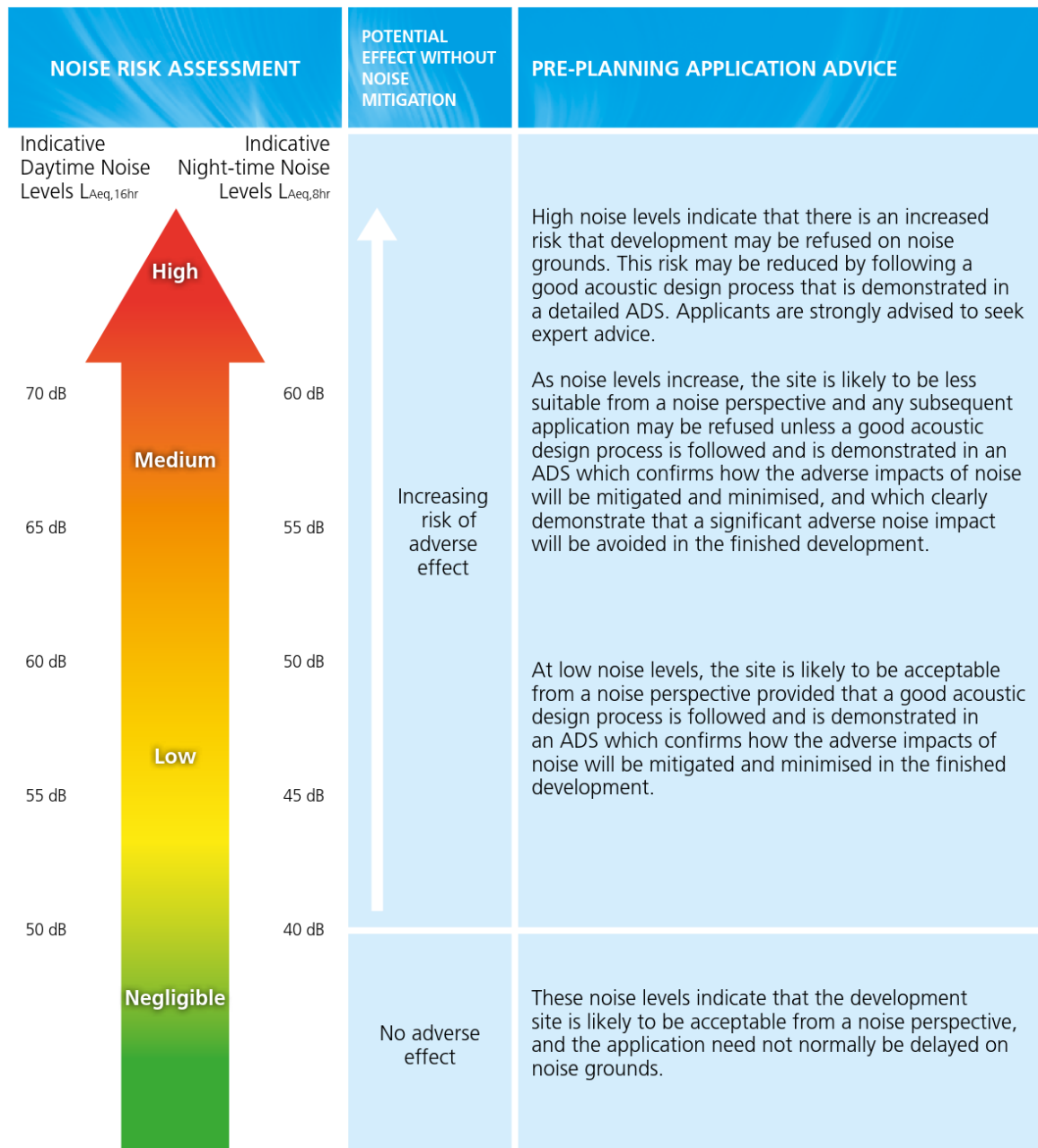
Table 1: BS 8233:2014 recommended acoustic design criteria (dB $L_{Aeq,T}$)

Activity	Location	Daytime 07:00 – 23:00 hours	Night-time 23:00 – 07:00 hours
Resting	Living room	35	-
Dining	Dining room/area	40	-
Sleeping (daytime resting)	Bedroom	35	30

- 2.15 BS 8233 also recognises that regular individual noise events at night can cause sleep disturbance. Peaks of noise from individual events are usually described in terms of $L_{Amax,F}$ values and these can be highly variable and unpredictable.

ProPG

- 2.16 There is also guidance in 'ProPG: Planning & Noise – New Residential Development' (2017), although this guidance does not constitute official government guidance and has no legal standing. The ProPG describes a staged approach to the assessment of noise impact on proposed new residential development sites. Stage 1 is an initial site noise risk assessment, indicating whether the proposed site is considered to pose a negligible, low, medium or high risk from a noise perspective.
- 2.17 The ProPG initial site noise risk assessment criteria are shown in Chart 1.

Chart 1: ProPG Stage 1: Initial Site Noise Risk Assessment Criteria**Figure 1 Notes:**

- Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.
- Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".
- $L_{Aeq,16hr}$ is for daytime 0700 – 2300, $L_{Aeq,8hr}$ is for night-time 2300 – 0700.
- An indication that there may be more than 10 noise events at night (2300 – 0700) with $L_{Amax,F} > 60$ dB means the site should not be regarded as negligible risk.

2.18 Chart 1 broadly sets out indicative noise levels that define the element of risk of noise impact on proposed residential development land, ranging from 'Negligible' to 'High'.

- 2.19 The guidance states that these noise levels “*should be interpreted flexibly having regard to the locality, the project and the wider context*”.
- 2.20 Stage 2 of the ProPG approach is a more detailed assessment in the form of an Acoustic Design Statement (ADS). However, the acoustic design criteria that are specified in ProPG, and which forms the basis of the ADS, are essentially the same as those recommended in BS 8233, as summarised previously in Table 1 of this report.
- 2.21 Similarly to BS 8233, ProPG recognises that regular individual noise events at night can cause sleep disturbance. The ProPG guidance suggests that for design purposes, wherever practicable, peaks of noise inside bedrooms from external sources should not exceed 45 dB $L_{Amax,F}$ more than 10 times per night’.

BS 6472

- 2.22 Guidance on measuring and assessing the potential annoyance of building occupants resulting from vibration in buildings is set out in British Standard 6472-1:2008 ‘*Guide to evaluation of human exposure to vibration in buildings - Part 1: Vibration sources other than blasting*’. Human exposure to vibration can also be assessed based on a time and frequency weighted dose response, Vibration Dose Values, $VDV\ ms^{-1.75}$. The standard includes a section on intermittent vibrations (e.g. from passing trains) which requires the vibration exposure to be determined in terms of the ‘vibration dose value’. This takes into account the magnitude of the vibration and the duration of exposure.
- 2.23 The vibration dose value for the day or night-time period can be calculated using the formula:

$$VDV_{b/d, day/night} = \left(\int_0^T a^4 t (dt) \right)$$

where: $VDV_{b/d, day/night}$ is the vibration dose value
 $a(t)$ is the frequency weighted acceleration in ms^{-2}
 T is the total period of day or night (in seconds) during which vibration can occur

- 2.24 Vibration dose values (in $ms^{-1.75}$) in residential buildings at which various degrees of adverse comment may be expected are quoted in BS 6472 and are reproduced in Table 2.

Table 2: Extract from BS 6472 in VDV $\text{ms}^{-1.75}$

Period	Low probability of adverse comment	Adverse comment possible	Adverse comment probable
Daytime (07:00 – 23:00)	0.2 – 0.4	0.4 – 0.8	0.8 – 1.6
Night-time (23:00 – 07:00)	0.1 – 0.2	0.2 – 0.4	0.4 – 0.8

- 2.25 BS 6472 states that below $0.2 \text{ ms}^{-1.75}$ in the daytime and $0.2 \text{ ms}^{-1.75}$ at night “*adverse comment is not expected*”.

Acoustic Design Criteria

- 2.26 For this development we therefore recommend the following noise criteria be adopted in respect of railway noise with windows closed and trickle ventilation provided:
- Daytime noise below 35 dB $L_{\text{Aeq},16\text{hr}}$ inside living rooms and bedrooms, 40 dB $L_{\text{Aeq},16\text{hr}}$ inside dining rooms; and
 - Night-time noise levels not exceeding 30 dB $L_{\text{Aeq},8\text{hr}}$ and generally not exceeding 45 dB L_{AmaxF} in bedrooms (i.e. no more than 10 times per night).
- 2.27 The criteria stated in Table 1 are for sources of “anonymous noise” i.e. noise without a specific character. Therefore, due to the character of noise from the nearby commercial/industrial premises, lower noise limits have been adopted for the proposed new dwellings, we recommend the following reduced noise criteria be adopted again with windows closed and trickle ventilation provided:
- Non-anonymous daytime noise below 30 dB $L_{\text{Aeq},16\text{hr}}$ inside living rooms and bedrooms, 35 dB $L_{\text{Aeq},16\text{hr}}$ inside dining rooms; and
 - Non-anonymous night-time noise levels not exceeding 25 dB $L_{\text{Aeq},8\text{hr}}$ and generally not exceeding 40 dB L_{AmaxF} in bedrooms.
- 2.28 For private outdoor amenity spaces of the new houses (e.g. rear gardens) BS8233 states that ‘it is desirable that the external noise level does not exceed 50 dB $L_{\text{Aeq},16\text{hr}}$ with an upper guideline value of 55 dB $L_{\text{Aeq},16\text{hr}}$ which would be acceptable in noisier environments’. In our experience, most local planning authorities have traditionally adopted, or accepted, the 55 dB(A) guideline value for rear gardens of proposed new residential developments. However, the 2014 version of the standard also recognises that these guideline values are not achievable in all circumstances where development might be desirable and in such cases, for sites near to the ‘strategic transport network’ higher noise

levels than 55 dB $L_{Aeq,16hr}$ in gardens may be acceptable. Nevertheless, for this development, we have adopted a criterion of 55 dB $L_{Aeq,16hr}$ in gardens as far as is practicable.

- 2.29 Our outline noise mitigation recommendations to achieve the adopted design criteria are described in Section 6.0.
- 2.30 In terms of vibration from passing trains, we recommend that vibration levels inside dwellings are controlled to so as not to exceed the 'low probability of adverse comment' values stated in BS 6472 as shown in Table 2 above.

3.0 NOISE SURVEY

3.1 Noise measurements were carried out at eight locations on the development land that are representative of the proposed dwellings at relevant points around the boundary of the site which will be closest to noise sources. The measurement locations are indicated in Figure 1 and are described below:

- Location A: 50m from railway line on eastern boundary
- Location 1: 40m from River Irk overlooking Hexpol TPE
- Location 2: 15m from River Irk overlooking reservoir
- Location 3: 10m from boundary with Hexpol TPE
- Location 4: 25m from Vitafoam service yard (to southeast)
- Location 5: 65m from Vitafoam Mill building
- Location 6: 30m from Vitafoam service yard (to west)
- Location 7: 95m from Vitafoam Mill building

3.2 Automated noise measurements were undertaken at Location A in terms of a series of consecutive 5-minute measurements from 13:50 Thursday 8 to 13:50 Friday 9 April 2021. Attended noise surveys were also carried out at Locations 1 to 7 on Thursday daytime and the end of the night/early morning on Friday.

3.1 The purpose of the surveys was to determine the potential noise impact from the railway to the east and the commercial/industrial premises south of the development site (i.e. Vitafoam and Hexpol TPE).

3.2 The noise measurements were taken at a microphone height of approximately 1.4m above the ground. Calibration checks were carried out both before and after the measurement periods with no variance in levels noted. Frequency analysis was also carried out.

3.3 The weather conditions during the noise survey were suitable for the purposes of the survey and subsequent assessment.

3.4 The results of the noise survey are summarised in Table 3, and the full results along with details of the equipment used, and the weather conditions during the survey periods, are shown in Appendix II.

Table 3: Summary of measured noise levels (dB)

Location	$L_{Aeq,T}$	$L_{A90,T}$
1. 40m from River Irk overlooking Hexpol TPE	49 – 51	47 – 49
2. 15m from River Irk overlooking Reservoir	47 – 64	45 – 63
3. 10m from boundary with Hexpol TPE	51 – 53	49 – 50
4. 25m from Vitafoam service yard (to southeast)	51 – 54	50 – 52
5. 65m from Vitafoam Mill building	49 – 54	46 – 53
6. 30m from Vitafoam service yard (to west)	52 – 53	50 – 51
7. 95m from Vitafoam Mill building	50	49

- 3.5 Noise measurements at Locations 1 and 3 were influenced by the external plant located on the eastern elevation of the Hexpol building and distant road traffic. The external plant was steady in noise level and operated continuously throughout the surveys. There were also occasional loading/unloading activities at the Hexpol service yard during daytime hours only.
- 3.6 At Location 2 noise levels were influenced by distant road traffic and occasional activities from Vitafoam to the southwest, where noise levels were between 47 and 50 dB $L_{Aeq,15mins}$. There were also periods when the pump house plant operated at the reservoir on the opposite side of the River Irk. During these periods noise levels increased up to 64 dB, although this period was noted to be of approximately 30 minutes duration and the pump house did not operate again during the survey periods.
- 3.7 Noise measurements at Locations 4 to 7 were influenced by activities at Vitafoam, which included vehicle movements at both service yards (located to the west and southeast of the development site) and external plant on the northern elevation of the Vitafoam Mill building.
- 3.8 Other sources of noise noted were birdsong, distant passing trains to the east and distant road traffic.
- 3.9 Representative background sound levels were taken at locations and during periods when no significant noise was influencing the measurement.

Railway Noise

- 3.10 The daily numbers of trains using the line are summarised in Table 4, and have been derived from available timetables and Network Rail's open data feed platform. The numbers of freight trains passing the shown in Table 2 reflect the highest typical number of trains passing the site in a day.

Table 4: Daily Numbers of Trains Passing the Site

Train Type	Daytime 07:00-23:00	Night 23:00-07:00
Passenger	115	17
Freight	Up to 23	Up to 7

- 3.11 The majority of trains that pass the site are three or four carriage local passenger trains, however there are occasional five carriage passenger trains and occasional slow moving freight trains. The railway track that runs past the site is of a 'continuously welded track' construction.
- 3.12 The number of passenger trains currently passing the site appears to be similar to pre COVID19 values, and it is unlikely that freight train movements on this line will be affected by COVID19.
- 3.13 Automated noise measurements were undertaken at Location A and the results are shown in Table 5.

Table 5: Railway noise exposure values (dB)

	Daytime (L _{Aeq,16hr})	Night-time (L _{Aeq,8hr})
Location A – 50 metres from railway line	53	50

- 3.14 The values shown in Table 5 represent low levels of railway noise. Short-term peaks of noise at this location were in the range 45 – 78 dB L_{Amax,F} with the 10th highest value being 67 dB L_{Amax,F}.
- 3.15 The implications of the noise survey results are set out in Section 5.0 and have been used to determine the type and extent of any noise mitigation measures necessary to achieve the adopted noise design criteria.

4.0 RAILWAY VIBRATION SURVEY & ASSESSMENT

- 4.1 Ground vibration from passing trains was measured at the noise measurement location described above (i.e. Location A as shown in Figure 1). The vibration measurements were carried out using a Vibrock V901 vibration meter (s/n: 1479) and tri-axial VDV transducer. The corresponding daytime and night-time VDV values for the site extrapolated from the vibration measurements are shown in Table 6.

Table 6 Extrapolated Vibration Dose Values in $\text{ms}^{-1.75}$

Period	VDV		
	X	Y	Z
Daytime (08/04/2021)	0.039	0.035	0.049
Night-time (08/04/2021)	0.034	0.03	0.041
Daytime (09/04/2021)	0.039	0.036	0.051

- 4.2 The vibration dose values that are shown in Table 6 are very low.
- 4.3 The daytime and night-time VDV values are well below the threshold values for adverse comment that are set out in BS 6472. Therefore, no special vibration isolation measures will be necessary at this development. As such, there are no constraints on residential development of the site by reason of ground vibration from the trains passing on the railway line to the east of the site.

5.0 NOISE ASSESSMENT

Hexpol TPE

- 5.1 We understand that processes within the Hexpol building operate 24 hours Monday to Friday. However, loading/unloading and service yard activities are only carried out in daytime, 08:00 to 17:30 hours. Although, there is some noise from the external plant operating continuously, this is at a low noise level and steady in nature. Therefore, from our observations and assessment it is only the potential noise impact associated with yard activities that needs to be considered further, as described below.
- 5.2 HGVs enter the site via the access road to the north of the River Irk and manoeuvre round so that the side of the trailer is facing towards the building delivery entrance. The trailer is uncovered and fork lift trucks (FLT) manoeuvre in and out of the building via fast acting roller shutter doors. Once completed the trailer is closed up and the driver sets off. The whole process takes approximately 1 hour.
- 5.3 A noise level of 53 dB $L_{Aeq,15mins}$ was measured at 30 metres from these yard activities, a distance that is representative of the nearest proposed dwellings. This sound level also includes steady low level noise from the external plant and, as this was not influenced by any extraneous noise, this level of 53 dB $L_{Aeq,15mins}$ is considered to be the 'specific sound level'. As a worst case this has been assumed to continue over the whole 1 hour assessment period.
- 5.4 Due to the intermittent nature of the yard activities a 3 dB acoustic feature penalty has been applied. The BS 4142 initial assessment is shown in Table 7.

Table 7: BS 4142 Initial Assessment of Hexpol TPE yard activities at the nearest dwelling (dB)

Description	Plot 294
Specific Sound Level Outside Dwelling	53
Acoustic character correction	+3
Rating Level at Dwelling	56
Representative Background Sound Level	47
Difference	11
Initial estimate	'significant adverse impact'

- 5.5 The rated sound level from yard activities is above the representative background sound level measured outside the nearest proposed dwellings. In terms of a BS 4142 assessment the conclusion is a significant adverse impact during the daytime period, in the absence of any noise mitigation measures.
- 5.6 However, the context in which the sound from Hexpol TPE occurs must also be considered and, where necessary/appropriate, the assessment modified accordingly. BS 4142 states that all pertinent factors are taken into consideration.
- 5.7 In particular, there is an opportunity to implement noise mitigation measures at the nearest proposed dwellings to reduce potential noise impact as far as is practicable. BS 4142 states that any such noise mitigation should be taken into account as part of the context.
- 5.8 Our noise mitigation recommendations to protect the amenity of the new residents, and in so doing to safeguard the interests of the business', are described in Section 6.

Vitafoam Works

- 5.9 It is not clear what the hours of operation are at the Vitafoam Works, however from observations during the daytime and night-time surveys the majority of operations take place in the daytime. However, service yard activities do appear to operate throughout the night. Therefore, the potential noise impact associated with yard activities needs to be considered, particularly at night.

- 5.10 The service yard to the southeast is raised up above the ground height of the development site by approximately 2 metres. The yard appears to be used predominantly for the parking of trailers. HGVs either enter or exit the Vitafoam site via Don Street. Trailers are parked up and 'derigged' and the HGV moves off to park to the rear of the site. HGVs, or shunter vehicles, occasionally enter the yard to 'rig up' the trailers and either move the trailer to another part of the site or exit via Don Street.
- 5.11 A noise level of 53 dB $L_{Aeq,15mins}$ was measured at 25 metres from these yard activities, a distance that is representative of the nearest proposed dwellings. This sound level was not influenced by any extraneous noise and therefore is considered to be the 'specific sound level'.
- 5.12 Vehicle/trailer movements are sporadic, however the 'rigging/derigging' of the trailers results in some impulsive sounds. Therefore, a 6 dB acoustic feature penalty has been applied. The BS 4142 assessment is shown in Table 8.

Table 8: BS 4142 Initial Assessment of Vitafoam yard activities at the nearest dwelling (dB)

Description	Plots 47 & 48
Specific Sound Level Outside Dwelling	53
Acoustic character correction	+6
Rating Level at Dwelling	59
Representative Background Sound Level	46
Difference	13
Initial estimate	'significant adverse impact'

- 5.13 The rated sound level from yard activities is above the representative background sound level measured outside the nearest proposed dwellings. In terms of a BS 4142 assessment the conclusion is a significant adverse impact during the night-time period, in the absence of any noise mitigation measures.
- 5.14 However, the context in which the Vitafoam sound occurs must also be considered and, where necessary/appropriate, the assessment modified accordingly. BS 4142 states that all pertinent factors are taken into consideration.

- 5.15 In particular, there is an opportunity to implement noise mitigation measures at the nearest proposed dwellings to reduce potential noise impact as far as is practicable. BS 4142 states that any such noise mitigation should be taken into account as part of the context.
- 5.16 Our noise mitigation recommendations to protect the amenity of the new residents, and in so doing to safeguard the interests of the business', are described in Section 6.

Initial Railway Noise Risk Assessment

- 5.17 The railway noise exposure levels on the eastern boundary of the site fall between, the 'Low' and 'Medium' risk categories of ProPG in the daytime and at night.
- 5.18 It is considered that that the site is suitable for residential development, however railway noise levels in areas closest to eastern boundary do need to be taken into account and noise mitigation provided where necessary.

6.0 RECOMMENDED NOISE MITIGATION SCHEME & CONCLUSION

Noise Mitigation Scheme

6.1 The purpose of the noise mitigation measures for commercial noise is twofold; firstly to protect the amenity of the new residents adequately from noise from the nearby commercial/industrial premises, and secondly, in so doing, to safeguard the current and future business interests of these premises. In this way the development would comply fully with the requirements of para. 182 of the National Planning Policy Framework (NPPF).

6.2 Noise mitigation measures have also been recommended for new dwellings along the eastern boundary close to the railway line.

Gardens

6.3 We recommend proprietary acoustic fencing of 2.2 metres in height in areas closest to Hexpol TPE premises as indicated in Figure 2.

6.4 It is understood that the installation of a 3.1 metres high acoustic fence has been agreed at the boundary of the trailer yard of Vitafoam Works as indicated in Figure 2.

6.5 The acoustic fencing must be imperforate (i.e. have no holes or gaps), have a surface mass no less than 10 kg/m² and be at least 20mm thick.

6.6 Suppliers of proprietary acoustic fences include GRAMM Barrier Systems Ltd (www.grammbarriers.com) Jacksons Fencing (www.jacksons-fencing.co.uk), Guardian Fencing (www.guardianfencing.com) and Ransfords (www.ransfords.co.uk).

Glazing

6.7 We recommend that living rooms and bedrooms of the dwellings indicated in Figure 2 are fitted with the following high specification of glazing (minimum 33 dB R_w + C_{tr}):

- 8.4mm Solaglas 'Stadip Silence' laminated glass - nominal (8-20mm) cavity - 6mm glass; or
- 10mm glass - nominal (8-20mm) cavity - 6mm glass.

6.8 We recommend that bedrooms of the dwellings indicated in Figure 2 are fitted with the following high specification of glazing (minimum 29 dB R_w + C_{tr}):

- 6.4mm Solaglas 'Stadip Silence' laminated glass - nominal (8-20mm) cavity - 4mm glass; or
- 8mm glass - nominal (8-20mm) cavity - 4mm glass.

6.9 For all other living rooms and bedrooms, on the development, we recommend standard double glazing of 4mm glass - nominal (10-16mm) cavity - 4mm glass (25 dB $R_w + C_{tr}$).

6.10 Due care and attention must be taken to ensure that all glazing is well-fitted.

Ventilation

6.11 All living rooms and bedrooms as indicated in Figure 2, will require an acoustically treated means of ventilation, instead of standard window frame slot vents, to achieve the internal noise criteria. We would recommend either:

- Aereco EHA2 Acoustic Trickle Ventilator with acoustic canopy and sleeve (44 dB $D_{n,e,w}$); or
- Rytons AAC125HP Super Acoustic Controllable LookRyt AirCore Ventilator (43 dB $D_{n,e,w}$); or
- Another ventilation system with a good acoustic performance (i.e. above 40 dB $D_{n,e,w}$).

6.12 Ventilation proposals will need to be agreed with the Council at an early stage.

Rooms in Roof Spaces

6.13 We recommend that any bedrooms in roof spaces on outward facing elevations as indicated in Figure 2 have ceilings of 2 layers of 15mm dense plasterboard (e.g. Gyproc 'SoundBloc' or Gyproc 'Fireline', or equivalent).

External Walls

6.14 The exact construction of the external walls of dwellings is not known at this stage however it is assumed that the sound insulation performance of the wall construction will not be less than 50 dB R_w .

Planning Condition

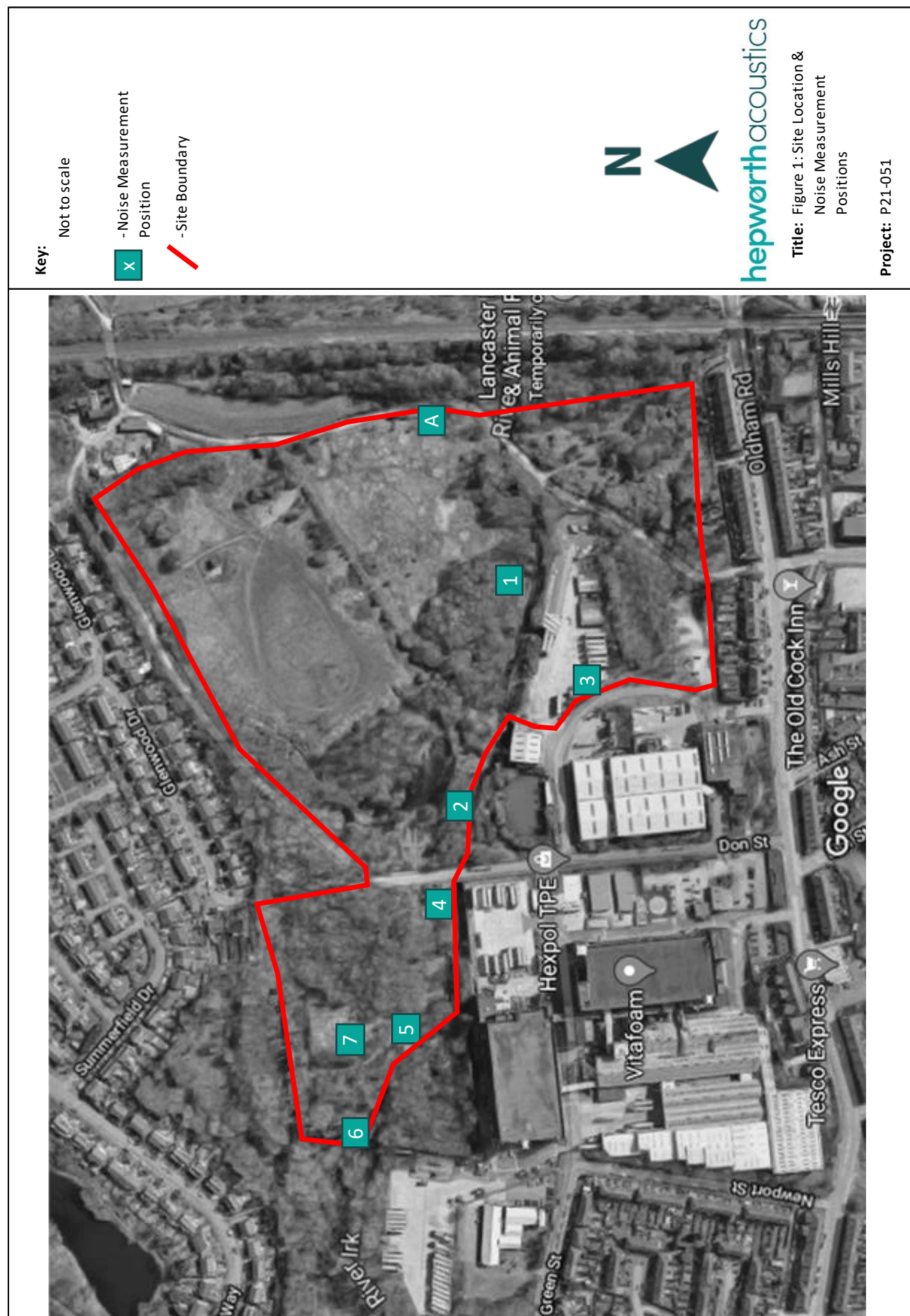
6.15 The need to ensure that an adequate scheme of noise mitigation is implemented can be formalised by an appropriately worded planning condition that requires a scheme of noise mitigation measures as described in this report to be implemented prior to occupation of relevant dwellings.

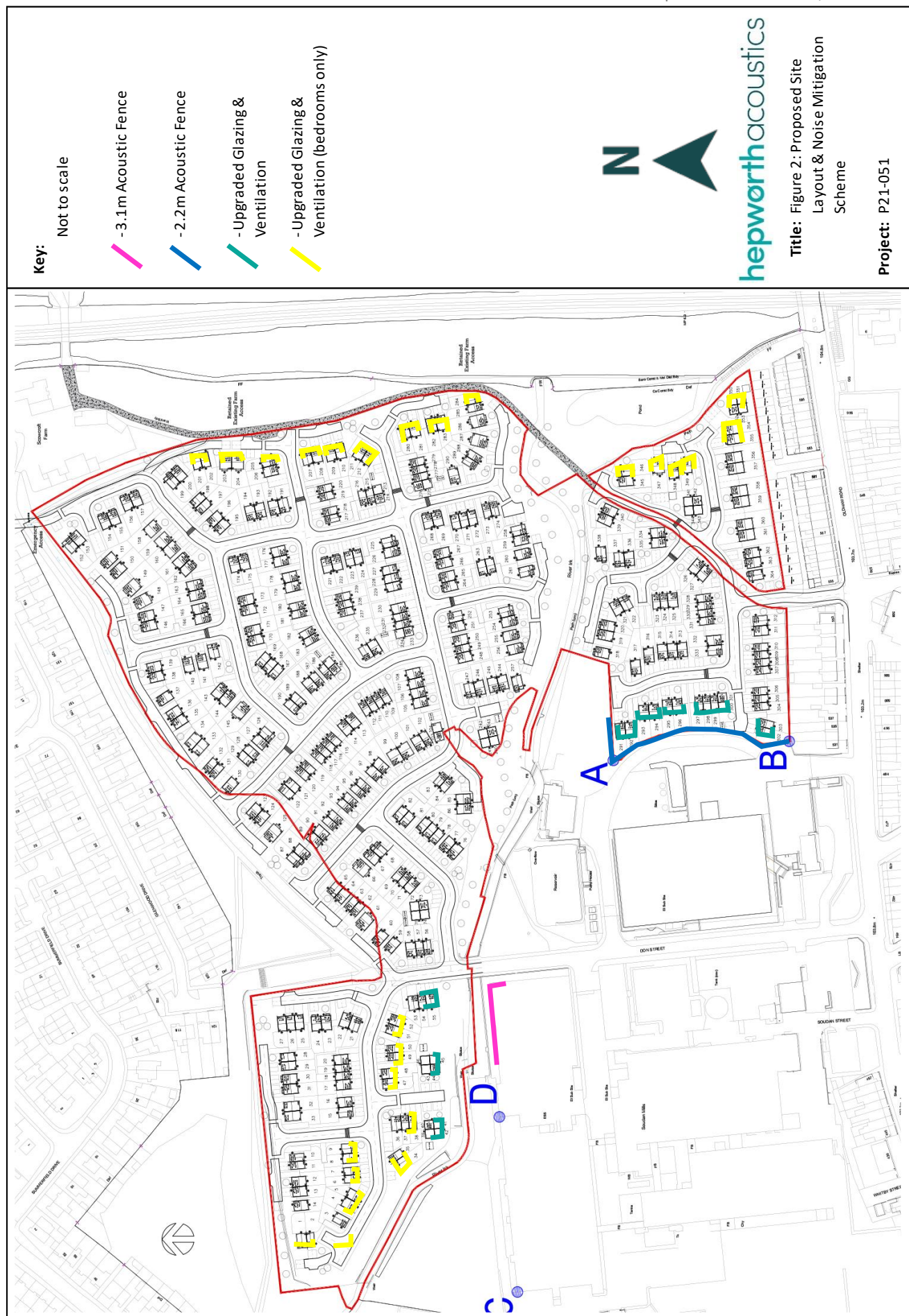
Conclusion

- 6.16 Subject to the recommendations for mitigation measures made above we conclude that potential noise impact from the railway and the commercial/industrial premises would not result in any unacceptable harm to residential amenity by reason of noise disturbance. Also, the proposed noise mitigation measures would safeguard the business interests of the commercial/industrial premises and thus comply fully with para. 187 of the NPPF.
- 6.17 Furthermore, 'significant adverse impacts' would be avoided and 'adverse impacts' would be mitigated/minimised, bringing the development in line with the aims of the Noise Policy Statement for England (NPSE) 2010.

7.0 SUMMARY

- 7.1 The impact of noise has been assessed for a proposed residential development on land off Don Street, Middleton.
- 7.2 The assessment has included the measurement of noise levels at appropriate locations on the site as well as railway vibration.
- 7.3 The ProPG Initial Site Noise Risk Assessment indicates the development land is of 'Low' to 'Medium' risk from the adverse effects of railway noise during the day and at night.
- 7.4 The assessment has concluded that there would be potential noise impact on the proposed residential development from nearby commercial/industrial premises, in the absence of adequate noise mitigation measures.
- 7.5 We have therefore recommended that an appropriate scheme of noise mitigation is implemented for the relevant new houses that will protect the amenity of the new residents and also safeguard the business interests of the nearby commercial/industrial premises, both now and in the future.
- 7.6 Ground vibration exposure levels were found to be well below the threshold for the onset of annoyance as defined in BS 6472 such that no vibration mitigation measures are necessary for any of the proposed dwellings.
- 7.7 The implementation of an adequate scheme of noise mitigation measures can be ensured by the use of an appropriately worded planning condition.





Appendix I: Noise Units & Indices

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kiloHertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

Glossary of Terms

When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices can be used. The indices used in this report are described below.

- C_{tr} This is an A-weighted urban traffic noise spectrum, which can be added to $D_{nT,w}$ or R_w in some standards to take into account different source spectra such as low frequency sound.
- R This is the 'Sound Reduction Index' as measured in a laboratory, and is a measure of the sound insulation properties of an building element in a stated frequency band.
- R_w This is the 'Weighted Sound Reduction Index', and is a single figure quantity of R , the laboratory measured Sound Reduction Index.
- $D_{n,e,w}$ This is the weighted element normalized level difference as measured in a laboratory, and is a measure of the sound insulation properties of small building elements such as ventilators.
- L_{Aeq} This is the A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.
- L_{Amax} This is the maximum A-weighted noise level that was recorded during the monitoring period.
- L_{A90} This is the A-weighted noise level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

Appendix II: Noise Survey Results

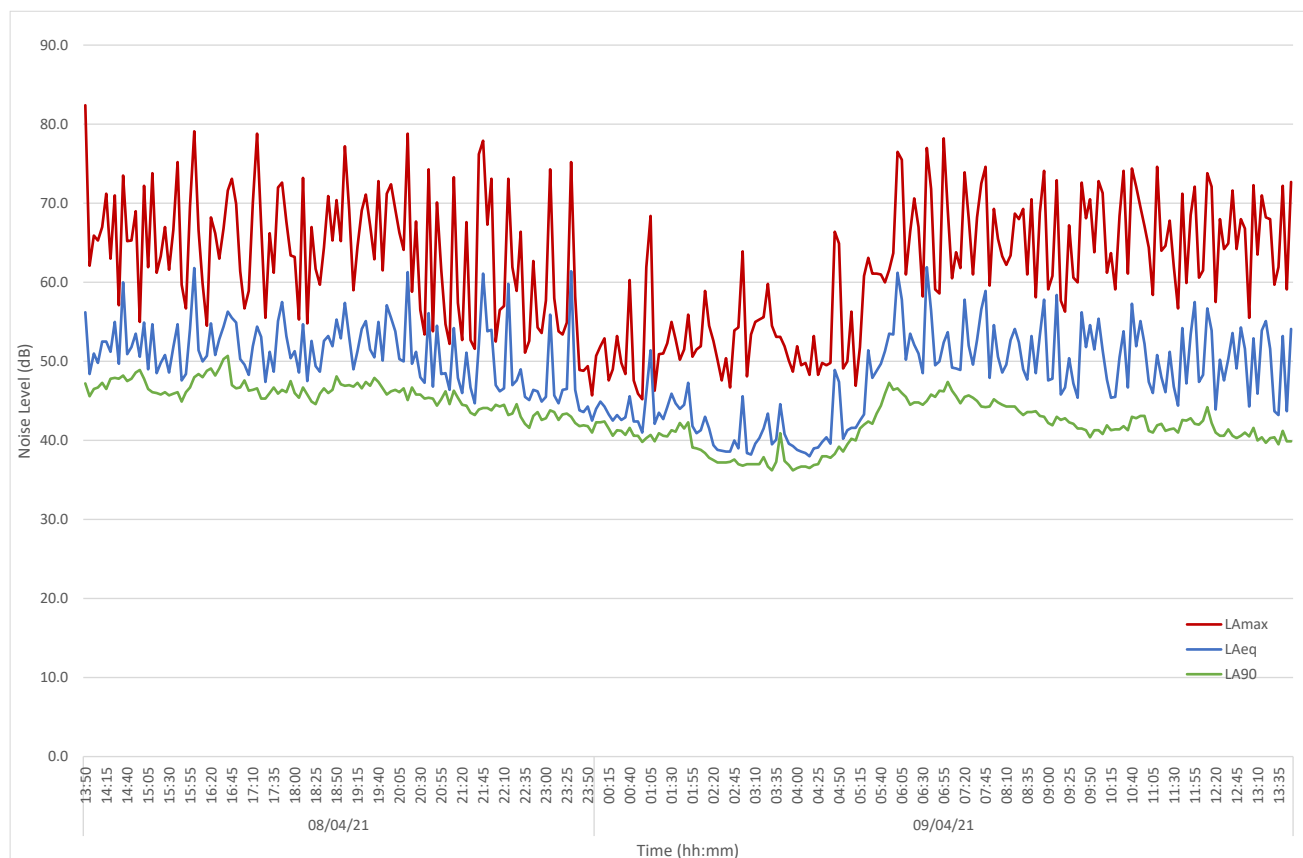
Date(s): Thursday/Friday 8/9 April 2021

Equipment: Rion NL-52 'Class 1' sound level meter (serial no. 00242747)
B&K 2260 'Type 1' sound analyser (serial no. 2467016)
with tripods, calibrators and environmental kit, pole and windshield

Weather: Daytime – Dry, cold (~7-9°C), clear skies and calm (<2 m/s)
Night-time – Dry, cold (~7-9°C), clear skies and calm (<2 m/s)

All levels in dB(A)

Location A: 50m from railway line on eastern boundary



Location 1: 40m from River Irk overlooking Hexpol TPE

Date	Time		Measured Noise Levels (dB)			Comments
	Start	End	L _{Amax}	L _{Aeq}	L _{A90}	
08/04/2021	10:50	11:05	64.0	50.9	48.8	Steady plant noise from Hexpol, birdsong, distant road traffic
	13:05	13:20	62.6	49.3	46.8	Steady plant noise from Hexpol, HGV leave, birdsong, distant road traffic
09/04/2021	06:55	07:10	66.8	50.7	49.2	River/weir, birdsong, distant road traffic

Location 2: 15m from River Irk overlooking reservoir

Date	Time		Measured Noise Levels (dB)			Comments
	Start	End	L _{Amax}	L _{Aeq}	L _{A90}	
08/04/2021	09:34	09:35	65.7	55.9	54.5	pump house operating
	09:35	09:37	66.3	63.6	62.7	pump house operating
	10:30	10:45	65.9	50.4	46.8	River/weir, alarm at Vitafoam, distant road traffic, birdsong
	12:10	12:25	62.7	48.3	45.0	HGV movement on Don St, HGV enter Hexpol, river/weir, distant road traffic, birdsong
	13:25	13:40	58.7	47.0	45.0	River/weir, distant road traffic, birdsong
09/04/2021	07:15	07:30	64.3	49.4	44.8	River/weir, birdsong, distant road traffic

Location 3: 10m from boundary with Hexpol TPE

Date	Time		Measured Noise Levels (dB)			Comments
	Start	End	L _{Amax}	L _{Aeq}	L _{A90}	
08/04/2021	11:30	11:44	69.6	52.2	49.8	Steady plant noise from Hexpol, FLT passby on access road, distant road traffic
	11:45	12:00	67.6	51.2	49.4	Steady plant noise from Hexpol, distant road traffic
	12:27	12:29	60.8	51.1	49.6	HGV opening trailer, occasional FLT beepers
	12:30	12:44	72.7	51.7	49.2	HGV unloading, FLT movements
	12:45	13:00	73.4	53.0	49.6	HGV unloading, FLT movements

Location 4: 25m from Vitafoam service yard (to southeast)

Date	Time		Measured Noise Levels (dB)			Comments
	Start	End	L _{Amax}	L _{Aeq}	L _{A90}	
08/04/2021	10:30	10:45	66.0	52.1	50.9	River/weir, distant low level steady plant noise from Vitafoam north elevation, HGV manoeuvre at yard at 1031. Vehicle moving around in/near yard at 1037, road sweeper briefly on Don St, alarm and cutting noise from Vitafoam at 1043
	11:50	12:05	68.9	52.9	51.6	River/weir noise, steady plant on north elevation of Vitafoam, went off at 1149, HGV departure from yard at 1153, some impacts outside east elevation of Vitafoam mill building at 1158, idling HGV shunt cab in yard at 1159, brief impact from HGV rigging and then it drives off
	13:10	13:25	67.0	52.9	51.7	River/weir noise, hGV/shunter movements in yard, occasional voices, impact noise from HGV rigging/de-rigging, distant road traffic
09/04/2021	06:05	06:20	70.6	51.8	50.0	River/weir, HGV leaving, shunter idling rigging trailer (L _{max}), birdsong
	06:20	06:35	69.8	54.0	49.6	River/weir, HGV arriving, birdsong
	07:35	07:50	72.2	51.4	49.8	River/weir, HGV arriving, L _{max} from rigging trailer, birdsong

Location 5: 65m from Vitafoam Mill building

Date	Time		Measured Noise Levels (dB)			Comments
	Start	End	L _{Amax}	L _{Aeq}	L _{A90}	
08/04/2021	09:50	10:05	58.8	49.0	46.6	River/weir, Very low level steady plant noise from north elevation of Vitafoam, distant pump house noise from reservoir to the southeast, birdsong, HGV manoeuvre at Vitafoam yard to southeast, distant road traffic
	10:50	11:05	63.8	53.2	48.3	Modest steady broadband noise from vent/plant halfway up Vitafoam mill northern elevation, distant cutting noise, River noise, additional plant on at Vitafoam further to the west at 1052
	12:10	12:25	67.3	54.4	52.8	Vent/plant halfway up Vitafoam northern elevation now off, some other plant further along now operating, shunter moving trailers in yard to east-almost inaudible, some distant impact noise from Vitafoam yard to east
09/04/2021	06:35	06:50	62.8	49.3	46.6	River/weir, birdsong
	07:50	08:05	62.5	49.3	46.4	River/weir, birdsong

Location 6: 30m from Vitafoam service yard (to west)

Date	Time		Measured Noise Levels (dB)			Comments
	Start	End	L _{Amax}	L _{Aeq}	L _{A90}	
08/04/2021	10:10	10:25	70.9	51.7	49.5	River/weir, distant road traffic, birdsong, no noise from HGV service yard to southwest
	11:30	11:45	67.3	53.0	51.4	River/weir, distant road traffic, birdsong, single impact from HGV service yard to southwest at 1134
	12:30	12:45	75.1	51.8	50.1	River/weir, distant road traffic, birdsong, distant HGV movements just audible, L _{max} = user error

Location 7: 95m from Vitafoam Mill building

Date	Time		Measured Noise Levels (dB)			Comments
	Start	End	L _{Amax}	L _{Aeq}	L _{A90}	
08/04/2021	11:10	11:25	59.0	50.4	49.4	Steady plant at Vitafoam northern elevation still operating. Distant HGV noise in Vitafoam yard adjacent to Don St at 1111.
	12:50	13:05	56.2	50.3	49.2	Distant road traffic, distant plant noise