



e3p

Noise and Vibration Impact Assessment

Castleton Sidings

Reference: 50-285-R1-6

Date: November 2023



NOISE AND VIBRATION IMPACT ASSESSMENT

Castleton Sidings

Prepared for:

Kellen Homes

Report Ref: 50-285-R1-6

Date Issued: 30th November 2023

E3P

Taylor Road
Trafford Park
Urmston
Manchester
M41 7JQ

+ 44 (0) 161 707 9612
<https://e3p.co.uk>

Registered in England
CRN: 807255262

QUALITY ASSURANCE

PROJECT NUMBER	50-285		
VERSION	Version 1	Version 5	Version 6
REMARKS	Draft for Comment	Final	Final
DATE	6th April 2022	7th November 2023	30th November 2023
PREPARED BY	L Faulkner	L Faulkner	L Faulkner
QUALIFICATIONS	BSc (Hons), PGDip, MIOA	BSc (Hons) MEnvSci MIOA	BSc (Hons) MEnvSci MIOA
POSITION	Associate Director	Associate Director	Associate Director
CHECKED BY	S Boughton	S Boughton	S Boughton
QUALIFICATIONS	BEng (Hons), AMIOA	BEng (Hons), MIOA	BEng (Hons), MIOA
POSITION	Consultant	Senior Consultant	Senior Consultant
AUTHORISED BY	L Faulkner	L Faulkner	L Faulkner
QUALIFICATIONS	BSc (Hons), PGDip, MIOA	BSc (Hons) MEnvSci MIOA	BSc (Hons) MEnvSci MIOA
POSITION	Associate Director	Associate Director	Associate Director

EXECUTIVE SUMMARY

BACKGROUND

Site Address	Castleton Sidings, Fairway, Rochdale OL11 3BX
National Grid Reference	E 387844 N 410096
Proposed Development	Hybrid planning application comprising: Full planning application for residential development, including access, car parking, landscaping, open space and associated engineering and infrastructure including an electric substation and foul water pump station; and Outline planning permission with all matters reserved for the principle of development to facilitate the East Lancashire Railway (ELR) extension.
Report Objectives	The objectives of this report are to: Identify, measure and assess the potential impact of any existing noise sources in the immediate vicinity of the Site upon proposed residential development. The report follows current and relevant British Standards in order to provide a robust assessment.

ASSESSMENT

Surveys Completed	E3P has undertaken two unattended road and rail traffic sound surveys in order to capture sound from the railway lines to the north and to the south, as well as road traffic sound associated with the M62. Furthermore, a vibration survey has been conducted concurrently with the sound survey at the northern area of the site where rail traffic is more dominant.
Assessments	A 3D noise model has been constructed to assess potential rail and road traffic sound impact across the site, within rear garden areas and incident upon proposed facades. External and internal noise levels are assessed in accordance with the criteria given in BS 8233:2014+A1:2019. Rail vibration was found to result in a less than low probability for adverse comment.
Mitigation Requirements	It was found that an acoustic barrier is required along the southern boundary along the rear garden edges in order to control noise levels in rear gardens in order to achieve levels as close as possible to 55 dB. Considering the distance from the source, M62, a compromise between unduly high barriers and slightly elevated noise levels has been made. Furthermore, whole dwelling ventilation is required for plots in order to provide background ventilation. Open windows are sufficient for purge ventilation and to mitigate overheating.

CONCLUSIONS

The assessment has found that, with mitigation measures in place, no adverse impact is predicted at the proposed receptors during daytime and night-time periods.

As such, noise need not be a determining factor in the granting of planning permission.



TABLE OF CONTENTS

EXECUTIVE SUMMARY	2
Background	2
Assessment.....	2
Conclusions	2
1. INTRODUCTION	4
1.1. Background	4
1.2. Proposed Development.....	4
1.3. Limitations	4
2. ASSESSMENT METHODOLOGY	5
2.1. National Planning Policy Framework	5
2.2. National Planning Practice Guidance.....	5
2.3. Building Regulations: Approved Document F - Volume 1: Dwellings (June 2022)	7
2.4. Building Regulations: Approved Document O – Overheating (June 2022)	8
2.5. British Standard BS 8233:2014+A1:2019 – Guidance on Sound Insulation and Noise Reduction for Buildings.....	9
2.6. British Standard BS6472-1: 2008: Guide to evaluation of Human Exposure to Vibration in Buildings	9
3. SURVEY RESULTS.....	11
3.1. Rail Traffic Sound Measurement.....	11
3.2. Ambient Sound Measurement	12
3.3. Rail Vibration Survey.....	13
4. NOISE IMPACT ASSESSMENT	15
4.1. External Amenity Area Noise Level Assessment.....	15
4.2. Internal Noise Level Assessment	16
4.2.1. Ventilation Condition	16
4.2.2. Overheating Condition	16
5. MITIGATION	18
5.1. External Amenity Areas	18
5.2. Façade Insulation	18
6. CONCLUSION AND RECOMMENDATIONS.....	20
APPENDIX I GLOSSARY OF ACOUSTIC TERMINOLOGY	21
APPENDIX II MEASURED SOUND PRESSURE LEVELS.....	24
APPENDIX III FIGURES	28



1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by Kellen Homes to undertake a Noise and Vibration Impact Assessment to accompany a Planning Application for a residential development at the former Castleton Sidings in Rochdale, to be referred to hereafter as '*the Site*'.

This assessment looks to determine the key existing noise and vibration sources and assess their impact upon proposed receptors and to specify mitigation measures, where required.

1.2. PROPOSED DEVELOPMENT

Kellen Homes intends to submit a Hybrid planning application comprising:

- ✦ Full planning application for residential development, including access, car parking, landscaping, open space and associated engineering and infrastructure including an electric substation and foul water pump station; and
- ✦ Outline planning permission with all matters reserved for the principle of development to facilitate the East Lancashire Railway (ELR) extension.

The key sources of existing sound impacting upon the Site is road traffic associated with the M62 motorway and the passing of trains along the multiple lines bounding the site. Furthermore, there is potential for rail vibration to be perceptible along the boundary with the line.

This assessment has been undertaken in accordance with the following supplied drawings:

- ✦ CAD Site Layout (Drawing Number KH003-A-100 Rev A) dated 3rd November 2023.

1.3. LIMITATIONS

Where a noise or vibration survey is required to inform an assessment, E3P will endeavour to ensure that all noise and vibration measurements taken are robust, representative and reliable in order to inform an accurate assessment.

Where mitigation measures are specified in this report, it should be noted that these measures are relative to a specific sound or vibration source, both in terms of the measured sound pressure and vibration level and the character of the sound source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, E3P cannot be held responsible for any subsequent variations in the proposed mitigation performance.



2. ASSESSMENT METHODOLOGY

2.1. NATIONAL PLANNING POLICY FRAMEWORK

To prevent unacceptable risks from pollution, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be considered.

The national planning policy framework states that planning policies and decisions should aim to:

- ✿ Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development.
- ✿ Mitigate and reduce to a minimum, other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions.
- ✿ Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.
- ✿ Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.2. NATIONAL PLANNING PRACTICE GUIDANCE

Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Local planning authorities' plan-making and decision-making should take account of the acoustic environment and in doing so consider:

- ✿ Whether or not a significant adverse effect is occurring or is likely to occur.
- ✿ Whether or not an adverse effect is occurring or is likely to occur.
- ✿ Whether or not a good standard of amenity can be achieved.

In line with the explanatory note of the NPSE, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase, where applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.



The “observed effect levels” are as follows:

-  **Significant observed adverse effect level:** This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
-  **Lowest observed adverse effect level:** This is the level of noise exposure above which adverse effects on health and quality of life can be detected.
-  **No observed effect level:** This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 2.1 summarises the noise exposure hierarchy, based on the likely average response.

TABLE 2.1 NOISE EXPOSURE HIERARCHY

PERCEPTION	EXAMPLES OF OUTCOMES	INCREASING EFFECT LEVEL	ACTION
Not Noticeable	No effect.	No observed effect	No specific measures required
Noticeable and Not Intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No observed adverse effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television, speaking more loudly, or having to close windows for some of the time because of the noise where there is no alternative ventilation. 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, having to keep windows closed most of the time because of the noise where there is no alternative ventilation. 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 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 (auditory and non-auditory).	Unacceptable adverse effect	Prevent



The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any situation. These factors include the following:

- ✿ The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day. The adverse effect can also be greater simply because there is less background noise at night.
- ✿ For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise can be important.
- ✿ The spectral content of the noise and the general character of the noise. The local topology and topography should also be considered along with the existing and, where appropriate, the planned character of the area.

More specific factors to consider when relevant:

- ✿ Where applicable, the cumulative impacts of more than one source should be considered along with the extent to which the source of noise is intermittent and of limited duration.
- ✿ Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases, a suitable alternative means of ventilation is likely to be necessary.
- ✿ If external amenity spaces are an intrinsic part of the overall design, then the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.3. BUILDING REGULATIONS: APPROVED DOCUMENT F - VOLUME 1: DWELLINGS (JUNE 2022)

Approved document F Volume 1: Dwellings (ADF) provides guidance set by the Department for Levelling Up, Housing and Communities, that relates to means of ventilation within dwellings. The ventilation strategy specified within the ADF are as follows.

1.9 The ventilation strategy in this approved document relies on a combination of all of the following.

- a. Extract ventilation from rooms where water vapour or pollutants are likely to be released (e.g. bathrooms and kitchens), to minimise their spread to the rest of the building. Ventilation fans may be either intermittent operation or continuous operation.*
- b. Whole dwelling ventilation to provide fresh air to the building and to dilute, disperse and remove water vapour and pollutants not removed by extract ventilation.*
- c. Purge ventilation to remove high concentrations of pollutants and water vapour. Purge ventilation is used intermittently and required only for pollutants produced by occasional activities (e.g. fumes from painting).*

1.10 Ventilation may be delivered through natural ventilation, mechanical ventilation or a combination of both.



1.11 The ventilation systems in this approved document are examples of systems that comply with Part F of the Building Regulations. Other ventilation systems may be acceptable if they can be shown to meet an equal level of performance.

Within the ADF there are three system specific ventilation systems that can be utilised to provide sufficient ventilation. These methods are as follow.

1. **Natural ventilation with background ventilators and intermittent extract fans** (guidance suitable only for less airtight dwellings) - Ventilation provided by thermal, wind or diffusion effects through doors, windows or other intentional openings without the use of mechanically driven equipment. For the purposes of this approved document, natural ventilation refers to a ventilation strategy using background ventilators and intermittent extract ventilation.
2. **Continuous mechanical extract ventilation** - Mechanically driven ventilation that continuously extracts indoor air and discharges it to the outside.
3. **Mechanical ventilation with heat recovery** - A mechanically driven ventilation system that both continuously supplies outdoor air to the inside of the dwelling and continuously extracts indoor air and discharges it to the outside. For the purposes of this approved document, the guidance for mechanical ventilation with heat recovery applies to centralised or decentralised supply and extract systems, with or without heat recovery.

2.4. BUILDING REGULATIONS: APPROVED DOCUMENT O – OVERHEATING (JUNE 2022)

Approved document O - Overheating (ADO) provides guidance set by the Department for Levelling Up, Housing and Communities, that relates to the mitigation of overheating. In relation to noise the ADO provides the following guidance.

3.2 In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

3.3 Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
- b. 55dB L_{AFmax} , more than 10 times a night (between 11pm and 7am).

3.4 Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants'

Measurement of Sound Levels in Buildings with the overheating mitigation strategy in use.

NOTE: Guidance on reducing the passage of external noise into buildings can be found in the National Model Design Code: Part 2 – Guidance Notes (MHCLG, 2021) and the Association of Noise Consultants' Acoustics, Ventilation and Overheating: Residential Design Guide (2020)



2.5. BRITISH STANDARD BS 8233:2014+A1:2019 – GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

The scope of this standard is the provision of recommendations for the control of noise in and around buildings including residential dwellings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 2.2.

TABLE 2.2 BS 8233:2014 RECOMMENDED INTERNAL NOISE LEVELS

CRITERION	TYPICAL SITUATION	DESIGN CRITERION, $L_{Aeq,T}$ (dB)
Suitable Resting and Sleeping Conditions	Living Room	35
	Bedroom	30

BS 8233 goes on to recommend noise levels for gardens:

It is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ 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 might be warranted.

BS 8233 goes on to say:

In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.

2.6. BRITISH STANDARD BS6472-1: 2008: GUIDE TO EVALUATION OF HUMAN EXPOSURE TO VIBRATION IN BUILDINGS

With respect to human exposure to building vibration, BS6472 provides guideline values of the Vibration Dose Value (VDV) above which various degrees of adverse comment may be expected from the occupants of residential buildings. The VDV is defined mathematically as the fourth root of the time integral of the fourth power of the vibration acceleration, after it has been frequency weighted. The guideline values recommended by BS6472 are shown in Table 2.3 below.

TABLE 2.3 BS 6472 GUIDELINE VALUES

PLACE	LOW PROBABILITY OF ADVERSE COMMENT	ADVERSE COMMENT POSSIBLE	ADVERSE COMMENT PROBABLE
Residential Buildings (16-hour day)	0.2-0.4	0.4-0.8	0.8-1.6
Residential Buildings (8-hour night)	0.1-0.2	0.2-0.4	0.4-0.8



Where the vibration is intermittent rather than continuous in nature, BS6472 defines procedures for calculating the estimated Vibration Dose Value (eVDV), based on the number and duration of vibration events and the recorded value of the root mean square frequency weighted vibration acceleration. The frequency weighting takes into account the response of the human body to vibrations of different frequency and whether the person is lying down or standing. The eVDV can then be taken as the VDV for use in the assessment of human exposure to vibration in buildings.

The above guidance relates to vibration measured at the point of entry into the human body, which is usually taken to mean the ground surface or at a point mid-span of an upper storey floor, rather than the point of entry into the building (a foundation element).



3. SURVEY RESULTS

The measurement position is detailed in Figure 1 of Appendix III.

3.1. RAIL TRAFFIC SOUND MEASUREMENT

E3P has conducted a Rail Traffic Noise Survey to measure the level of noise generated by locomotives along the main railway line before these split at the north eastern point of the Site during a typical daytime and night-time period. The survey was carried out over the following time periods in accordance with Calculation of Rail Noise (CRN):

- 📍 07:00 Thursday 31st March to 07:00 Friday 1st April 2022.

The following noise measurement position was chosen for the Rail Traffic Noise Survey:

- 📍 Noise Measurement Position 1 (NMP1): Located approximately 30 m from the nearside rail of the line to the north east of the Site. The microphone was located at a height of 1.5 m above ground level and in free-field conditions. The sound climate was dominated by occasional rail traffic, distant road traffic and birdsong.

A summary of the measured sound pressure levels from the Rail Traffic Noise Survey are presented in Table 3.1.

TABLE 3.1 SUMMARY OF MEASURED NOISE LEVELS FOR NMP1 – RAILWAY LINE

MEASUREMENT START TIME	MEASURED SOUND PRESSURE LEVELS (dB)	
	$L_{Aeq,T}$	10th Highest $L_{Amax,fast}$
07:00	58.5	N/A
08:00	57.9	
09:00	57.2	
10:00	56.0	
11:00	55.5	
12:00	56.7	
13:00	57.0	
14:00	57.0	
15:00	56.0	
16:00	58.4	
17:00	56.1	
18:00	57.5	
19:00	56.8	
20:00	55.6	
21:00	55.8	
22:00	56.8	



MEASUREMENT START TIME	MEASURED SOUND PRESSURE LEVELS (dB)	
	$L_{Aeq,T}$	10th Highest $L_{Amax,fast}$
23:00	53.2	77.0
00:00	46.5	
01:00	42.7	
02:00	43.4	
03:00	47.8	
04:00	48.1	
05:00	55.7	
06:00	55.9	
Average Daytime $L_{Aeq,16\text{ hour}}$		57
Average Night-time $L_{Aeq,8\text{ hour}}$		52

3.2. AMBIENT SOUND MEASUREMENT

E3P has conducted an ambient sound measurement on the southern boundary in order to capture sound from the M62 and any usage of the single railway line that bounds the Site over a weekday and weekend period. E3P understands that this line joins the East Lancashire Heritage Line which operates at its peak on weekends. The survey was carried out over the following time periods:

- 📍 10:00 Friday 1st April to 10:00 Tuesday 5th April 2022.

The following noise measurement position was chosen for the Noise Survey:

- 📍 Noise Measurement Position 2 (NMP2): Located approximately 15 m from the nearside rail of the line that bounds the site along the southern boundary. The microphone was located at a height of 1.5 m above ground level and in free-field conditions. The sound climate was dominated by occasional rail traffic, distant road traffic and birdsong.

A summary of the measured sound pressure levels from the Noise Survey are presented in Table 3.2.



TABLE 3.2 SUMMARY OF MEASURED NOISE LEVELS FOR NMP2

MEASUREMENT PERIOD	MEASURED SOUND PRESSURE LEVELS (dB)	
	$L_{Aeq,T}$	10th Highest $L_{Amax,fast}$
01/04/2022 10:00-23:00	55.8	-
01/04/2022 23:00-07:00	52.8	64.5
02/04/2022 07:00-23:00	54.7	-
02/04/2022 23:00-07:00	52.6	62.4
03/04/2022 07:00-23:00	53.4	-
03/04/2022 23:00-07:00	54.6	66.4
04/04/2022 07:00-23:00	57.8	-
04/04/2022 23:00-07:00	54.9	70.1

The levels highlighted above are the highest measured levels from all monitored days and will be used in the assessment.

During the survey, conditions remained dry and wind speeds rarely exceeded 5 m/s. The equipment outlined in Table 3.3 was used for the noise survey.

TABLE 3.3 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	LAST CALIBRATION DATE AT TIME OF SURVEY
NMP1	Sound Level Meter	01dB Fusion	12039	21st June 2021
	Pre-amplifier	01dB Pre22	1805124	
	Microphone	GRAS 40CE	330832	
	Calibrator	01dB Cal31	87281	3rd February 2022
NMP2	Sound and Vibration Level Meter	Svantek MK255 & SV12L	106978	14th July 2021
	Pre-amplifier			
	Microphone	MK255	20699	

The sound level meters were field calibrated on site using the above-mentioned calibrator prior to and after noise measurements were taken. No significant drift was witnessed as noted above. Calibration certificates are available upon request.

3.3. RAIL VIBRATION SURVEY

E3P has conducted attended vibration measurements of train pass-bys during a typical weekday period. The survey was carried out at the same time as NMP2.



Castleton Sidings

Noise and Vibration Impact Assessment

November 2023

The following vibration measurement position was chosen for the Rail Pass-by Survey:

-  **Vibration Measurement Position 1 (VMP1):** Located on the southern boundary of the Site with the railway line in a position representative of the closest proposed garden edge. The geophone of the meter was secured into the ground using the supplied spikes and levelled with the attached spirit level.

An attended measurement was undertaken so that the hourly dose value could be calculated. The overall VDV in each axis is presented in Table 3.4.

TABLE 3.4 RAIL VIBRATION VDV

MEASUREMENT PERIOD	TRANSVERSE VDV (m/s ^{-1.75})	LONGITUDINAL VDV (m/s ^{-1.75})	VERTICAL VDV (m/s ^{-1.75})
01/04/2022 10:00-23:00	0.001	0.001	0.007
01/04/2022 23:00-07:00	0.001	0.001	0.005
02/04/2022 07:00-23:00	0.001	0.001	0.005
02/04/2022 23:00-07:00	0.001	0.001	0.003
03/04/2022 07:00-23:00	0.001	0.001	0.009
03/04/2022 23:00-07:00	0.001	0.001	0.008
04/04/2022 07:00-23:00	0.002	0.002	0.008
04/04/2022 23:00-07:00	0.001	0.001	0.006

The vibration dose values that are shown above, even the maximum levels, are considered to be very low and fall well below the threshold values for low probability of adverse impact.

As such, further consideration of railway vibration is not considered to be required.

The following equipment was used for the vibration survey.

TABLE 3.5 VIBRATION MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	LAST CALIBRATION DATE AT TIME OF SURVEY
VMP1	Sound and Vibration Level Meter	Svante MK255 & SV12L	106978	14th July 2021



4. NOISE IMPACT ASSESSMENT

For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2023 MR2, to determine the impact of noise from road traffic sound.

The following inputs have been included in the model:

- ✳ CAD Site Layout Rev A.
- ✳ The M62 has been inputted into the noise model using worst-case traffic counts taken from the Department for Transport. The model is then verified by the noise levels measured at NMP2. The measured levels accord with the modelled levels at this position within 0.5 dB.
- ✳ NMP1 is used to ascertain the contribution from the main railway line to the east and accords with modelled levels.
- ✳ E3P note a proposed Metrolink line along the southern boundary. Accordingly, this is included in the model and calibrated assuming a tram travelling passed every 12 minutes, as per existing lines and based on measured levels of Metrolink Trams.
- ✳ Site elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government Licence v3.0.
- ✳ A reflection order of 2 has been used in all calculations.
- ✳ Average ground absorption is set at 0.5; and
- ✳ Noise levels generated using ISO 9613-1 and ISO 9613-2 "Acoustics – Attenuation of sound during propagation outdoors" as incorporated into CadnaA software.

4.1. EXTERNAL AMENITY AREA NOISE LEVEL ASSESSMENT

The noise model has been used to predict noise levels in external amenity areas which are to be used for relaxation. The predicted levels range from 45 dB and up to 60 dB in the worst affected areas.

As such, it is predicted that the No Observed Adverse Effect Level (NOAEL) is achieved in any small areas of the amenity space with noise levels of below 55 dB without mitigation measures in place, with the following commentary:

"Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life."

Accordingly, no action is required for these gardens.

However, amenity space close to the railway line will experience an exceedance of this criterion and, as such, will require mitigation measures. This is discussed in Section 5.1.



4.2. INTERNAL NOISE LEVEL ASSESSMENT

With regards internal noise levels, E3P has assumed a standard glazing specification of 4 mm glass/20 mm air space/4 mm glass affords sound insulation performance in the order of 31 dB however this is for a pink noise spectrum. The same unit, weighted for road traffic noise using the '+C_{tr}' correction, has a sound insulation performance value of approximately 25 dB and so this value has been used to calculate internal noise levels.

Motorway sound is noted to be the dominant sound source. Albeit, trains are audible but the application of the 25 dB reduction rather than 30 dB for rail noise is considered worst-case.

The model has been used to predict façade noise levels at all floor levels, assuming a three-storey building. In order to determine any requirements for mitigation, E3P has added the reduction provided by the glazing (25 dB) to the relevant criterion for day (35 dB) and for night (30 dB). As such, any facades subject to noise levels higher than 60 dB during the day and/or 55 dB during the night will require higher specification glazing.

The highest predicted day and night façade levels here are 60 dB and 55 dB respectively. As such, higher specification glazing is not required.

The maximum noise level likely to be experienced on south facing facades is noted to be 71 dB as per the measured data. When considering glazing provides attenuation of 31 dB for non-specific sound, the internal noise levels are likely to be approximately 40 dB, some 5 dB below the criteria. E3P have also considered the potential impact of trams along the southern boundary. Previous measurements have determined a 10th highest maximum noise level of 88 dB at 3 m for a passing tram. When distance corrected to the closest façade, this results in an expected level of 70 dB, accordingly, no higher specification glazing is needed.

4.2.1. VENTILATION CONDITION

It is assumed that the developer would be installing a whole dwelling ventilation system in accordance with Part F of the Building Regulations as it is assumed Natural Ventilation is not appropriate for these dwellings.

Where background ventilators form part of the system, consideration is required to the sound reduction provided by these when in the open position and, as such, are discussed in Section 5.0.

4.2.2. OVERHEATING CONDITION

E3P has considered the potential impact of noise, internally, should windows be opened to mitigate overheating, as per the criteria stipulated in ADO. Any plots/facades that pass this test can open windows for this without resulting in unacceptable internal noise levels. Those that fail the test would be subject to a Part O Overheating Assessment by a suitably qualified consultant.

Part O only applied to bedrooms at night in relation to the average 8-hour noise level and 10th highest maximum noise level. The site falls within a medium risk area.

As such, the allowable façade noise levels are 49 dB L_{Aeq,8hr} over the night time period and a maximum level of 64 dB L_{Amax,fast}. These levels are set based on a sound reduction of 9 dB provided by an open window.

As can be seen from the Figures, certain plots will have at least one façade in exceedance of the above levels and are subject to a Part O Overheating Assessment.



Castleton Sidings

Noise and Vibration Impact Assessment

November 2023

As such, these plots may require an alternative means of ventilation that can provide suitable air changes necessary to provide 'comfort cooling' dependent on the outcome of the overheating assessment.



5. MITIGATION

5.1. EXTERNAL AMENITY AREAS

Section 4.2 determined that the sound level in some external amenity areas would exceed the 55 dB criterion. As such, the noise model has been used to predict noise levels in the affected amenity areas with acoustic barriers in place.

Due to the distance to the motorway, barriers along this boundary are only partially effective with very little reduction compared to the height of barrier needed. Indeed, in order to achieve levels of 55 dB and below, barriers along this boundary would need to be at least 3.8 m in height which would need to be an earth bund and fence combination. However, BS 8233 provides the following advice:

It is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ 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 might be warranted.

BS 8233 goes on to say:

In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.

As such, E3P have assumed a maximum barrier height of 2.8 m, assuming a 0.4 m high earth bund with 2.4 m fence on top to be acceptable before any visual impact issues arise. The resultant noise model is shown in Figure 4. As can be seen, noise levels range between 54 and 57 dB in the gardens along this boundary. This level is considered acceptable and the lowest practicable noise levels with a compromise between slightly elevated noise levels and unduly high barriers.

The barriers proposed can be of wooden fence or brick wall construction but must be sealed at the base, be free from holes and have a minimum mass of 10 kg/m².

5.2. FAÇADE INSULATION

The previous section determined that standard thermal double glazing will be sufficient for all plots. However, when windows are opened for ventilation purposes, internal noise levels are exceeded and, as such, a whole dwelling ventilation system is required for all plots.

The overheating assessment determined that certain plots would experience an exceedance of the Part O criteria. Accordingly, the following plots would be subject to a ADO approved overheating assessment by a suitably qualified consultant (also highlighted in red on Figure 5):



Castleton Sidings

Noise and Vibration Impact Assessment
November 2023

-  Plot 8.
-  Plot 52.
-  Plots 63 and 64.
-  Plots 69 and 70.
-  Plot 87.
-  Plot 88.
-  Plots 104 to 111.
-  Plots 136 to 191.

NB: the above only applies where bedroom windows are located on red highlighted facades on that plot.

In order to achieve the required internal ambient noise levels, where background ventilators form part of the system, the reduction provided by the vent in the open position should, at least, match the attenuation provided by the glazing unit.

The number of background ventilators per room will be dependent on the requirements given in Building Regulations Part F.



6. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by Kellen Homes in order to undertake a Noise Impact Assessment for a proposed residential development on land at the former Castleton Sidings in Rochdale.

Unattended long term monitoring has been conducted to quantify levels of road and rail traffic sound across the site as well as a dedicated rail traffic vibration survey.

A 3D noise model has been constructed to assess potential road and rail sound upon the proposed receptors in accordance with the criterion, for day and night, given in BS 8233:2014+A1:2019.

The assessment determined that standard thermal double glazing would be sufficient with all plots requiring System 1 ventilation.

A barrier is required along the southern boundary in order to achieve the lowest practicable noise levels, below 56 dB, in the affected gardens at a height of 2.8 m. This can be earth bund and fence combination.

Rail vibration was found to be sufficiently low to be of low probability for adverse comment.

With mitigation measures in place, this assessment has shown that no adverse impact is predicted day or night at the proposed receptors due to existing sound sources.

Overheating assessments are recommended, in accordance with AD-O, for certain plots closest to the railway line.

As such, noise need not be a material consideration in the granting of planning permission as long as the recommendations of this report are followed and included within the design stage.

END OF REPORT



APPENDIX I

GLOSSARY OF ACOUSTIC TERMINOLOGY

NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. The most widely used weighting mechanism that best corresponds to the response of the human ear is the "A"-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective but, as a general guide, a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A1 TYPICAL SOUND PRESSURE LEVELS

SOUND PRESSURE LEVEL	LOCATION/EXAMPLE
0	Threshold of hearing
20–30	Quiet bedroom at night
30–40	Living room during the day
40–50	Typical office
50–60	Inside a car
60–70	Typical high street
70–90	Inside a factory
100–110	Burglar alarm at 1 m away
110–130	Jet aircraft on take off
140	Threshold of pain



ACOUSTIC TERMINOLOGY

TABLE A2 TERMINOLOGY

DESCRIPTOR	EXPLANATION
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2E-05 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. "A" weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
L_{Aeq, T}	L _{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
L_{Amax}	L _{Amax} is the maximum A-weighted sound pressure level recorded over the period stated. L _{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L _{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the "fast" sound level meter response.
L₁₀ and L₉₀	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The L _n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L ₁₀ is the level exceeded for 10% of the time and as such can be regarded as the "average maximum level". Similarly, L ₉₀ is the "average minimum level" and is often used to describe the background noise. It is common practice to use the L ₁₀ index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and away from buildings.
Fast	A time weighting used in the root-mean-square section of a sound level meter with a 125-millisecond time constant.
Slow	A time weighting used in the root-mean-square section of a sound level meter with a 1000-millisecond time constant.



APPENDIX II

MEASURED SOUND PRESSURE LEVELS

Castleton Sidings**Noise and Vibration Impact Assessment**

November 2023

TABLE A.1 HOURLY MEASURED SOUND PRESSURE LEVELS – NMP2

PERIOD START	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	MEASURED SOUND LEVEL, $L_{A10,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
01/04/2022 10:10	53.2	53.5	48.7
01/04/2022 11:10	50.2	51.7	47.5
01/04/2022 12:10	49.1	50.9	46.6
01/04/2022 13:10	48.6	50.6	46.2
01/04/2022 14:10	48.5	50.4	46.1
01/04/2022 15:10	47.8	49.6	45.2
01/04/2022 16:10	46.4	47.8	44.4
01/04/2022 17:10	47.1	48.6	45.3
01/04/2022 18:10	49.1	51.3	46.1
01/04/2022 19:10	56.0	57.8	53.4
01/04/2022 20:10	56.1	58.2	53.7
01/04/2022 21:10	57.8	59.4	55.5
01/04/2022 22:10	57.3	59.0	55.1
01/04/2022 23:10	53.4	55.6	50.1
02/04/2022 00:10	52.1	54.1	49.1
02/04/2022 01:10	52.0	54.2	48.8
02/04/2022 02:10	51.6	53.8	48.0
02/04/2022 03:10	50.0	52.6	46.0
02/04/2022 04:10	51.5	54.4	47.0
02/04/2022 05:10	53.5	55.4	51.0
02/04/2022 06:10	55.9	57.3	53.1
02/04/2022 07:10	54.8	56.6	52.2
02/04/2022 08:10	51.4	52.1	48.2
02/04/2022 09:10	55.3	57.1	52.9
02/04/2022 10:10	55.1	56.9	53.0
02/04/2022 11:10	55.1	56.9	52.8
02/04/2022 12:10	56.2	57.8	54.0
02/04/2022 13:10	55.9	57.7	53.3
02/04/2022 14:10	53.5	55.7	50.3
02/04/2022 15:10	55.8	57.5	53.5
02/04/2022 16:10	49.8	51.6	45.8
02/04/2022 17:10	55.5	57.3	53.2
02/04/2022 18:10	56.9	58.6	54.6



Castleton Sidings

Noise and Vibration Impact Assessment

November 2023

PERIOD START	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	MEASURED SOUND LEVEL, $L_{A10,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
02/04/2022 19:10	55.6	57.1	53.5
02/04/2022 20:10	53.7	55.1	51.7
02/04/2022 21:10	53.1	54.9	50.0
02/04/2022 22:10	52.0	53.7	49.6
02/04/2022 23:10	52.3	54.2	49.5
03/04/2022 00:10	51.0	52.9	48.2
03/04/2022 01:10	50.5	52.8	47.2
03/04/2022 02:10	50.4	52.7	46.5
03/04/2022 03:10	50.9	53.0	47.8
03/04/2022 04:10	51.9	54.0	49.0
03/04/2022 05:10	54.9	56.7	52.2
03/04/2022 06:10	55.4	57.0	53.1
03/04/2022 07:10	52.8	54.3	50.6
03/04/2022 08:10	51.3	52.6	49.5
03/04/2022 09:10	51.7	52.6	49.3
03/04/2022 10:10	51.6	53.4	48.8
03/04/2022 11:10	55.6	57.1	53.2
03/04/2022 12:10	51.4	53.4	48.5
03/04/2022 13:10	51.6	53.6	48.9
03/04/2022 14:10	52.4	54.5	49.1
03/04/2022 15:10	51.8	54.0	48.8
03/04/2022 16:10	54.8	56.8	52.0
03/04/2022 17:10	55.7	57.5	53.4
03/04/2022 18:10	55.4	57.1	53.1
03/04/2022 19:10	54.9	56.6	52.5
03/04/2022 20:10	53.3	55.3	50.6
03/04/2022 21:10	52.9	54.7	50.6
03/04/2022 22:10	52.4	54.3	49.7
03/04/2022 23:10	51.3	53.3	48.1
04/04/2022 00:10	51.4	53.6	48.1
04/04/2022 01:10	51.1	53.7	47.0
04/04/2022 02:10	51.4	54.0	47.2
04/04/2022 03:10	51.1	53.5	47.0
04/04/2022 04:10	54.9	57.2	51.7



Castleton Sidings**Noise and Vibration Impact Assessment**

November 2023

PERIOD START	AMBIENT SOUND LEVEL, $L_{Aeq,1hr}$ (dB)	MEASURED SOUND LEVEL, $L_{A10,1hr}$ (dB)	BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
04/04/2022 05:10	57.2	59.0	55.0
04/04/2022 06:10	59.1	60.6	56.8
04/04/2022 07:10	59.0	60.5	57.0
04/04/2022 08:10	58.9	60.5	57.0
04/04/2022 09:10	58.4	60.1	56.2
04/04/2022 10:10	57.8	59.6	55.5
04/04/2022 11:10	58.0	59.6	55.7
04/04/2022 12:10	58.0	59.5	55.5
04/04/2022 13:10	57.7	59.5	55.5
04/04/2022 14:10	58.4	60.0	56.3
04/04/2022 15:10	58.3	60.0	56.2
04/04/2022 16:10	58.0	59.7	55.9
04/04/2022 17:10	58.4	60.1	56.3
04/04/2022 18:10	57.7	59.4	55.5
04/04/2022 19:10	57.4	59.2	55.0
04/04/2022 20:10	56.4	58.2	53.9
04/04/2022 21:10	55.5	57.5	52.9
04/04/2022 22:10	54.7	56.8	51.7
04/04/2022 23:10	53.5	56.0	49.8
05/04/2022 00:10	52.1	54.7	48.0
05/04/2022 01:10	51.5	54.0	47.5
05/04/2022 02:10	51.3	53.8	47.4
05/04/2022 03:10	51.7	54.1	47.8
05/04/2022 04:10	53.8	56.1	50.5
05/04/2022 05:10	57.4	59.3	55.0
05/04/2022 06:10	59.5	61.1	57.2



APPENDIX III

FIGURES

[illegible]

Accommodation Schedule			KELLEN HOMES			
Sledging Sitings						
House Type	Bed No.	Type	No. left	Total left	Left	
Bedrooms						
Hc	Hc/ry 2	Mens	7	767	5389	3.4
Gc	Gc/ry 3	Smiths	8	188	1234	4.2
Gr	Gr/ry 3	J	4	911	3644	2.0
Car	Car 3	Semt	30	396	5040	5.2
					25337	15.38
Bedlin						
Hc	Hc/ry 2	Mens	21	767	3507	10.89
Gc	Gc/ry 3	Semt	14	586	1712	7.3
Gr	Gr/ry 3	J	31	911	3644	2.08
Car	Car 3	Semt	36	396	3338	13.57
Ac	Ac/ry 4	Semt/bedroom	9	282	644	2.2
Ac/ry	Ac/ry 4	J	9	282	367	1.57
Lc	Lc/ry 3	Detached	30	819	2943	10.47
Wc	Wc/ry 3	Detached	6	262	954	4.75
Ba	Ba/ry 3	Detached	6	390	3630	5.2
Blu	Blu/ry 3	Detached	6	3022	632	3.4
Wc	Wc/ry 3	Detached	3	3038	644	3.48
Wc	Wc/ry 3	Mens	8	1111	888	4.29
Wc	Wc/ry 3	Mens	4	1111	888	4.29
Ham	Ham/ry 4	Detached	12	333	3536	6.3
Arch	Arch 4	Detached	7	1289	888	5.88
					32231	98.82
		Total	162		108293	146.25
Guest Site Area			27 372	Acres	33 33	Hectares
POD	6 139			3 39		
Wc/ry	6 1			2 4		
Net Site Area	12 734			16 7		Hectares
Guest Density	7 07	Units/acre		17 47		Units/acre
Net Density	14 34	Units/acre		36 63		Units/acre
Guest Volume	696 73	BDT/Traffic		100 10		BDH/Traffic
Net Footing	1400 72	BDT/Traffic		330 61		BDH/Traffic

Project Engineer: L Faulkner
Date: 30/11/2023

Figure 2 - Daytime Grid Noise Map - Calculation at 1.5 m above ground level



Project:
Castleton Sidings

Project-No:
50-285

Client:
Kellen Homes

**Daytime Noise Level,
LAeq,16hr (dB)**

- ... <= 48
- 48 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 55
- 55 < ... <= 58
- 58 < ... <= 60
- 60 < ... <= 62
- 62 < ... <= 65
- 65 < ...

Noise Map Objects

- Road
- Railway
- Building
- Barrier
- Contour Line
- Building Evaluation
- Calculation Area

Project Engineer: L Faulkner
Date: 30/11/2023

Figure 3 - Night-time Grid Noise Map - Calculation at 4 m above ground level



Figure 4 - Daytime with Mitigation Grid Noise Map - Calculation at 1.5 m above ground level



Project:
Castleton Sidings

Project-No:
50-285

Client:
Kellen Homes

Daytime Noise Level, LAeq,16hr (dB)

...	<= 48
48 < ...	<= 50
50 < ...	<= 52
52 < ...	<= 55
55 < ...	<= 58
58 < ...	<= 60
60 < ...	<= 62
62 < ...	<= 65
65 < ...	

Noise Map Objects

- Road
- Railway
- Building
- Barrier
- Contour Line
- Building Evaluation
- Calculation Area

Project Engineer: L Faulkner
Date: 30/11/2023

Figure 5 - Plots Highlighted Exceed Part O Criteria

