Noise Impact Assessment

Site: Quarry Farm, Oakenholt
Reference: 51-296-R1-1
Date: July 24

e3p

E3P

Taylor Road
Trafford Park
Urmston
Manchester
M41 7JQ

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

Registered in England
CRN: 08725262

QUALITY ASSURANCE

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REV REF:	DESCRIPTION	AUTHOR	CHECKED	AUTHORISED	DATE
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WRITTEN BY	QUALIFICATIONS	POSITION
Scott Boughton	BA (Hons) MIOA	Senior Consultant

REVIEWED BY	QUALIFICATIONS	POSITION
Lee Faulkner	BSc (Hons) MIEnvSci MIOA	Associate Director

AUTHORISED BY	QUALIFICATIONS	POSITION
Lee Faulkner	BSc (Hons) MIEnvSci MIOA	Associate Director

EXECUTIVE SUMMARY

Site Address	Quarry Farm, Oakenholt, Flint CH6 5ST
National Grid Reference	E 325841, N 371502
Proposed Development	Proposed residential development circa 130 dwellings with associated access and landscaping.
Surveys Completed	E3P has conducted attended measurements of Leadbrook Drive in accordance with the Calculation of Road Traffic Noise. Attended measurements of noise associated with the manufacturing plant to the east have also been conducted.
Assessments Completed	A 3D noise model has been constructed to assess road traffic sound impact across the site and incident upon all facades and floors and in any external amenity areas. Road traffic sound has been assessed in accordance with the criterion set out in in BS 8233:2014. Consideration has been given to noise present from the manufacturing plant.
Mitigation Recommendations	The assessment determined that standard thermal double glazing will be sufficient across the site. A whole dwelling ventilation system is assumed to be installed across the site as per approved document F. E3P recommend a full overheating assessment be conducted for certain plots in accordance with the guidelines indicated in Part O. This will allow for the provision of an alternative method of providing the mitigation of overheating without the need for opening windows and protect future occupants from fixed plant sound associated with the manufacturing facility.
Conclusion and Discussion	With mitigation measures in place, this assessment has shown that no adverse impact is predicted day or night at the receptors due to road traffic sound or sound associated with the manufacturing facility.

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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by Castle Green Homes to undertake a Noise Impact Assessment for a proposed residential development on land at Quarry Farm in Oakenholt, to be referred to hereafter as 'the site'.

This assessment looks to determine the key noise sources that have potential to impact upon the noise sensitive development and to assess their impact, if any, upon proposed receptors and to specify mitigation measures, where required.

1.2. REPORT OBJECTIVES

The objectives of this report are as follows.

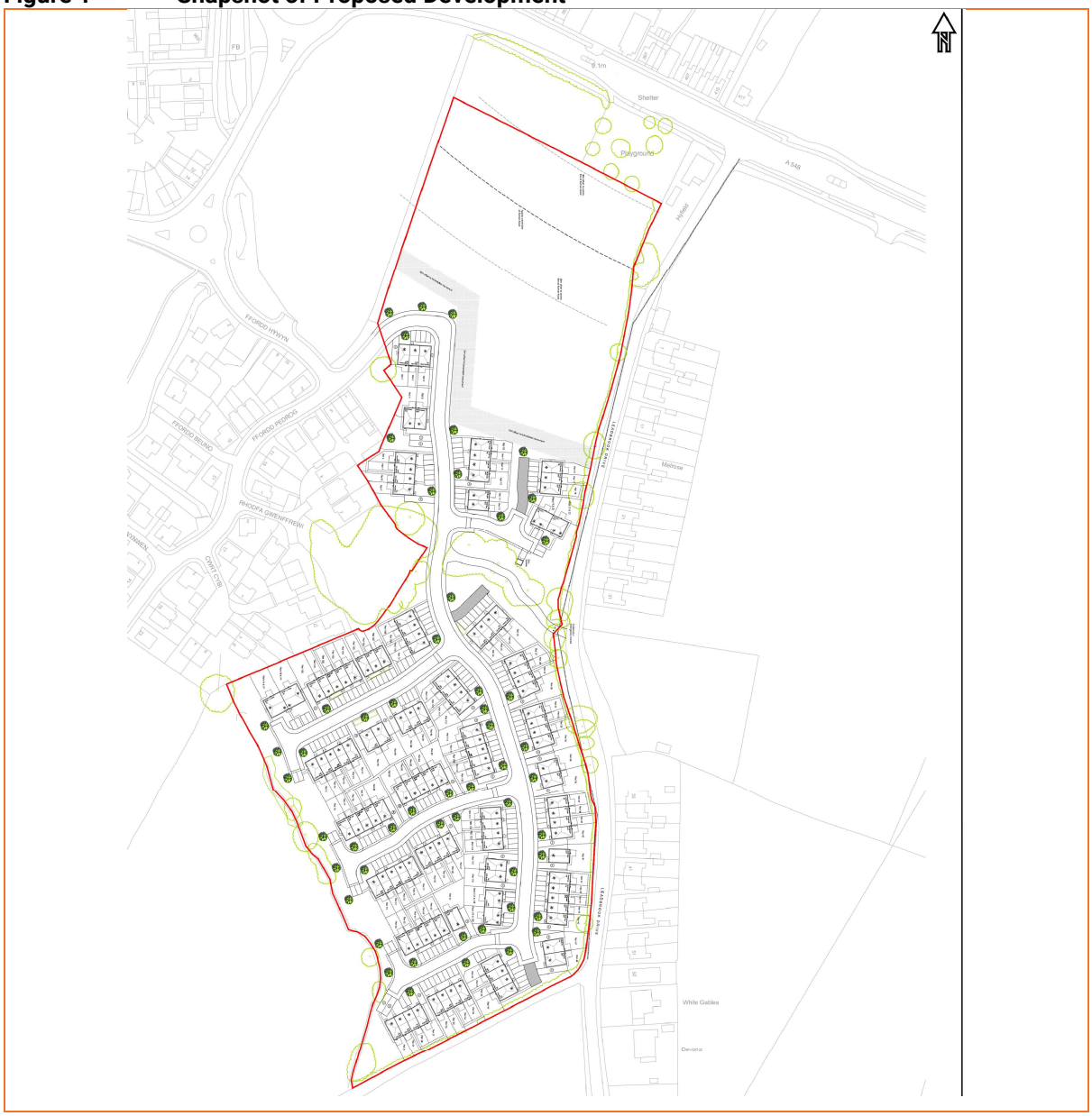
- Establish and measure the existing sound levels across the site, day and night.
- Consider the potential sources of sound impacting the site and to measure source sound levels of all applicable sources.
- Assess internal and external noise levels associated with road traffic in accordance with criteria given in BS 8233.
- Assess any noise associated with the Manufacturing Facility to the east of the site.
- Provide advice on mitigation measures, where required.

1.3. PROPOSED DEVELOPMENT

Castle Green Homes propose to construct 130 residential dwellings with associated access roads, parking and landscaping.

A snapshot of the proposed development layout is indicated in Figure 1.

Figure 1 Snapshot of Proposed Development



2. ASSESSMENT METHODOLOGY

2.1. FLINTSHIRE COUNTY COUNCIL

E3P are aware that the Local Planning Authority has provided the following commentary in relation to the proposed site:

> *A large industrial manufacturing plant is situated east of the proposal site and I note that there is no noise assessment report accompanying the application. Furthermore, I cannot see in the application any reference to the design and concepts, principles and advice being followed in accordance with the newly enacted Environment (Air Quality and Soundscapes)) (Wales) Bill 2024, specifically for 'soundscape' in this case. As this is a large application for many residential units, I think the applicant should be requested to comment on these points for completeness. I would then be able to finalise my consultation response.*

This report will seek to provide sufficient evidence to alleviate any concerns the LPA may have regarding noise from the nearby industrial manufacturing plant.

2.2. PLANNING POLICY WALES (2024)

2.2.1. AIR QUALITY AND SOUNDSCAPE

Clean air and an appropriate soundscape contribute to a positive experience of place as well as being necessary for public health, amenity and well-being. They are indicators of local environmental quality and integral qualities of place which should be protected through preventative or proactive action through the planning system. Conversely, air, noise and light pollution can have negative effects on people, biodiversity and the resilience of ecosystems and should be reduced as far as possible.

Certain sounds, such as those created by trees, birds or water features, can contribute to a sense of tranquillity whilst others can be reassuring as a consequence of their association with the normality of everyday activities. Problematic forms of sound are generally experienced as noise pollution and can affect amenity and be prejudicial to health or a nuisance. Noise action plans drawn up by public bodies aim to prevent and reduce noise levels where necessary and preserve soundscape quality where it is good. Noise levels used to identify priority areas contained in noise action plans are usually set quite high in order to focus resources on the most polluted areas and noise must meet a number of tests before it qualifies as a statutory nuisance. Lower levels of noise, however, can still be annoying or disruptive and impact on amenity and as such should be protected through the planning process wherever necessary. The planning system must protect amenity and it is not acceptable to rely on statutory nuisance under the Environmental Protection Act 1990 to do so.

The health imperative of good air quality and appropriate soundscapes in contributing to the overall character and quality of places and the health and well-being of people and wildlife should be fully recognised. It will not be appropriate to locate sensitive uses, such as hospitals, schools, care homes and housing adjacent to busy roads or other transport routes, where there are no connectivity benefits to be gained and where health and amenity impacts associated with increased exposure of people to pollution will be unacceptable. Whilst some uses may be appropriate with the aid of good design air quality and soundscape considerations can be overriding factors, especially for sensitive uses, if they cannot be adequately mitigated and impacts minimised.

Where sensitive developments need to be located close to existing transportation infrastructure for sustainable movement and access they should be designed, as far as practicable, to limit harmful substances and noise levels within and around those developments both now and in the future. This may include employing the principles of good acoustic design and the inclusion of active travel or travel management measures as part of development proposals. Such development, however, should preferably be located away from existing sources of significant noise, which may include aircraft noise or roads, particularly new roads or those with programmed route improvements.

Regard should be paid to current air quality and noise levels and the quality of the existing soundscape and account taken of any relevant local air quality action plan, noise action plan and/ or local or regional air quality strategy as part of development strategies and proposals in development plans and before determining planning applications.

2.3. NOISE AND SOUNDSCAPE ACTION PLAN 2018-2023

The noise action plan for Wales has a broader focus than simply controlling the level of noise. It links to the notion of creating appropriate soundscapes, meaning the right acoustic environment in the right time and place. The towns and cities serve us in a variety of ways, and it is believed should therefore contain a variety of soundscapes appropriate to the land use.

The Action Plan draws from information provided in Professional Practice Guidance (ProPG) and the relevant British Standards to recommend that placemaking, soundscapes and good acoustic design are considered and incorporated into the design and development of any new sites. It provides guidance on numerous sources of sound but does not set any guidelines, beyond those given in the British Standards.

It does relate to the European noise indices of the day-evening-night level, L_{den}, and the night level, L_{night}, which are used in the World Health Organisation's Environmental Noise Guidelines for the European Region (2018) but does not go so far as to stipulate the criterion from the guidelines. As such, the assessment that follows will primarily focus on the British Standards.

2.4. PLANNING GUIDANCE (WALES), TECHNICAL ADVICE NOISE (WALES) 11, NOISE (1997)

This note provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business. It outlines some of the main considerations which local planning authorities should consider in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

Noise Exposure Categories (NECs) have been derived to assist local planning authorities in their consideration of planning applications for residential development near transport related noise sources.

A recommended range of noise levels is given in Table 2.1 for each of the NECs for dwellings exposed to noise from road, rail, air and mixed sources. However, in some cases, it may be appropriate for local planning authorities to determine the range of noise levels they wish to attribute to the various NECs. Where there is a clear need for new residential development in an already noisy area some or all NECs might be increased by up to 3 dB(A) above the recommended levels. In other cases, a reduction of up to 3 dB(A) may be justified.

Table 1 Noise Exposure Categories for Dwellings

Noise source	Assessment period	Noise exposure category, $L_{Aeq,t}$ dB (A)[1]			
		A	B	C	D
Road Traffic	Daytime 07:00-23:00	<55	55-63	63-72	>72
	Night-time 23:00-07:00[2]	<45	45-57	57-66	>66
Rail Traffic	Daytime 07:00-23:00	<55	55-66	66-74	>74
	Night-time 23:00-07:00[2]	<45	45-59	59-66	>66
Air Traffic[3]	Daytime 07:00-23:00	<57	57-66	66-72	>72
	Night-time 23:00-07:00[2]	<48	48-57	57-66	>66
Mixed Sources[4]	Daytime 07:00-23:00	<55	55-63	63-72	>72
	Night-time 23:00-07:00[2]	<45	45-57	57-66	>66

Notes:

*[1] **Noise levels:** the noise level(s) ($L_{Aeq,T}$) used when deciding the NEC of a site should be representatives of typical conditions.*

*[2] **Night-time noise levels (2300-0700):** sites where individual noise events regularly exceed 82dBL_{Amax} (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8H}$ (except where the $L_{Aeq,8H}$ already puts the site in NEC D).*

*[3] **Aircraft noise:** daytime values accord with the contour values adopted by the Department of Transport which relate to levels measured 1.2m above open ground. For the same amount of noise energy, contour values can be up to 2 dB(A) higher than those of other sources because of ground reflection effects.*

*[4] **Mixed sources:** this refers to any combination of road, rail, air and industrial noise sources. The "mixed source" values are based on the lowest numerical values of the single source limits in the table. The "mixed source" NECs should only be used where no individual noise source is dominant.*

To check if any individual noise source is dominant (for the purposes of this assessment) the noise level from the individual sources should be determined and then combined by decibel addition (remembering first to subtract 2 dB(A) from any aircraft noise contour values). If the level of any one source then lies within 2 dB(A) of the calculated combined value, that source should be taken as the dominant one and the site assessed against the appropriate NEC for that source, rather than using the "mixed source" NECs. If the dominant source is industrial noise see paragraph B17 of Annex B.

If the contribution of the individual noise sources to the overall noise level cannot be determined by measurement and/or calculation, then the overall measured level should be used and the site assessed against the NECs for "mixed sources".

When assessing a proposal for residential development near a source of noise, local planning authorities should determine into which of the four NECs the proposed site falls, taking account of both day and night-time noise levels. Local planning authorities should then have regard to the advice in the appropriate NEC, as below:

- **A** - Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.
- **B** - Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.
- **C** - Planning permission should not normally be granted. Where it is considered that permission should be given, for example, because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
- **D** - Planning permission should normally be refused.

2.5. BUILDING REGULATIONS: APPROVED DOCUMENT F – VOLUME 1: DWELLINGS (JUNE 2022)

Approved document F Volume 1: Dwellings (ADF) for use in Wales 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.*
>
> *• 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.*
>
> *• Whole building ventilation to provide fresh air to the building and to dilute, disperse and remove water vapour and pollutants not removed by extract ventilation.*
>
> *• 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).*
>
> *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.*

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

In relation to noise the ADO for use in Wales provides the following guidance.

> *2.2 High levels of external noise could limit the use of cross-ventilation to mitigate the risk of summer overheating. External noise is a material consideration considered when applying for Planning permission and mitigating measures may be required in the design in order to obtain Planning permission and controlled through a condition imposed on the consent. In exceptional cases, this could include non openable windows. More commonly, windows will be openable in order to enable natural ventilation to occur at less sensitive times of day, when there is lower noise, when people are not present in the room, or when they are present but not engaged in noise-sensitive activities. But those windows may need to be kept closed at times to maintain acceptable indoor acoustic conditions, for example when people are using the rooms for sleep or office work. A noise issue may be identified at the Planning stage but rely on occupants to close windows at noise sensitive times rather than prevent them from ever opening them, and in those cases overheating strategies should assume windows will be closed during noise-sensitive periods even if they are not fixed closed.*
>
> *2.3 When the removing excess heat as part of the overheating strategy, noise levels in bedrooms should be kept to a minimum during the sleeping hours of 23:00 – 07:00. Building control bodies may accept as evidence that this requirement is satisfied: a. documentation to demonstrate that the local planning authority did not consider external noise to be an issue at the site at the planning stage or; b. if the local planning authority did consider external noise to be an issue that should be controlled through a condition at planning stage, then documentation to demonstrate that the proposals for heat removal (during the sleeping hours of 23.00 – 07.00) are accommodated within or do not conflict with documentation provided to the local planning authority to satisfy any related planning permission condition(s). (For example any expectation that windows on one or more façade, or in certain rooms, will need to be kept closed during noise-sensitive periods.)*
>
> *2.4 Where active measures (e.g. mechanical system) are used for removing excess heat within the overheating strategy, the noise generated by these measures, particularly within bedrooms and living rooms should be considered. Noise generated by ventilation/cooling systems (which may travel through ducts) and noise from the fan unit may disturb the occupants of the building and so discourage their use. Therefore, the designer should consider minimising noise by careful design and the specification of quieter products. Further guidance on mechanical ventilation systems can be found in Approved Document F.*

2.7. 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.

Table 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 LAeq,T, with an upper guideline value of 55 dB LAeq,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.*

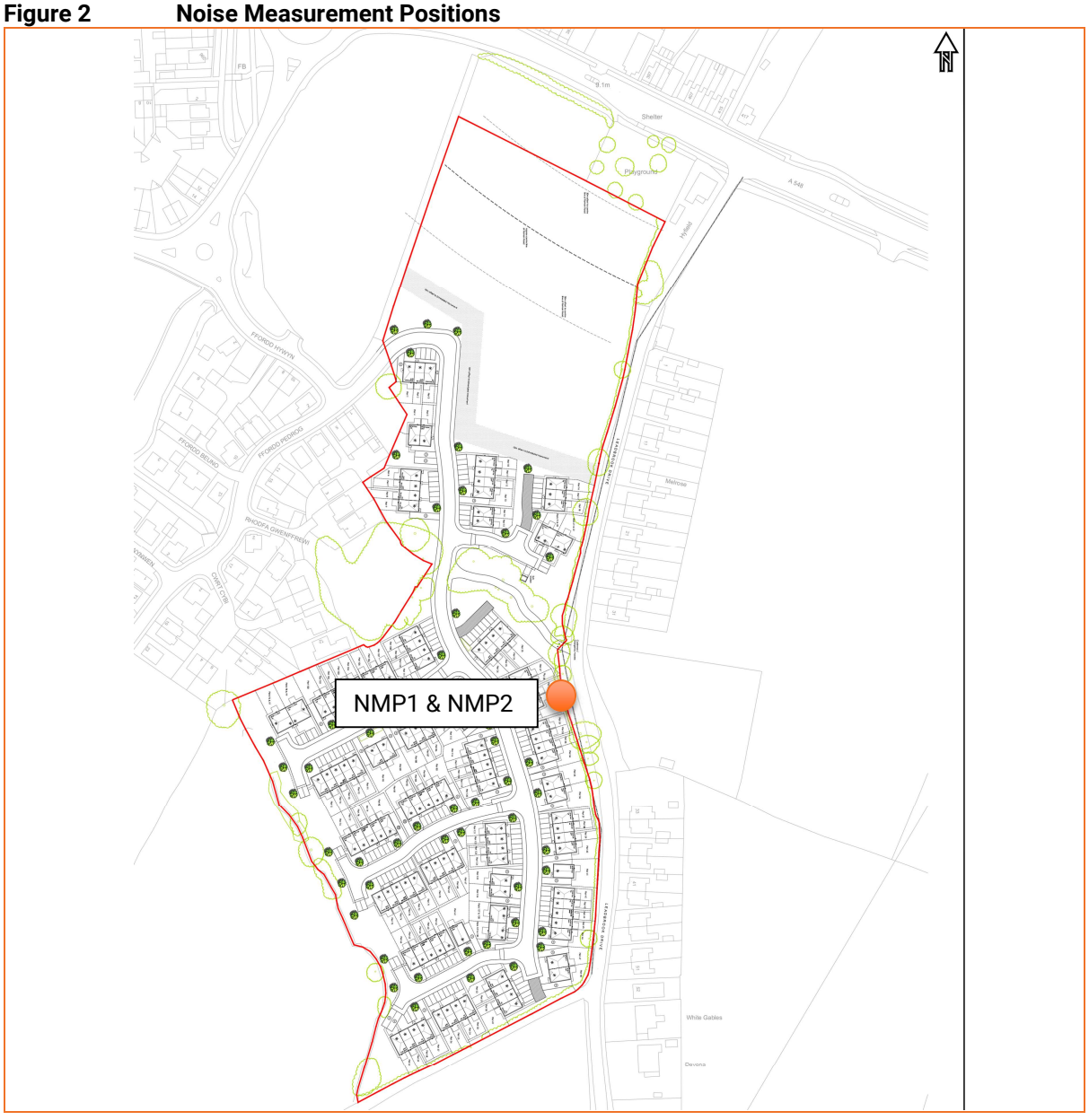
BS 8233 goes on to say:

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

3. SURVEY RESULTS

The surveys were conducted in the following locations:

Figure 2 Noise Measurement Positions



3.1. ROAD TRAFFIC SOUND SURVEY – LEADBROOK DRIVE

E3P has conducted a 3-hour shortened road traffic sound measurement in accordance with the procedures given in Calculation of Road Traffic Noise (CRTN). The survey was carried out over the following periods:

- 10:00-13:00 Monday 8th July 2024.

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

- Noise Measurement Position 1 (NMP1): Located on the eastern boundary of the site approximately 4 m from the nearside edge of Leadbrook Drive. The microphone was located at a height of 1.5 m above ground level and in free-field conditions. The sound climate consisted of road traffic along Leadbrook Drive. However, traffic flows here were low and the general noise climate during the day consisted of distant road traffic from the A548 between lulls in traffic along Leadbrook Drive.

A summary of the measured sound pressure levels from the Road Traffic Noise Survey is presented in Table 3.

Table 3 Measured Road traffic noise levels

Measurement start time	Measured sound pressure levels (dB)			
	$L_{Aeq,1hr}$	10th Highest $L_{Amax,fast}$	$L_{A10,1hr}$	$L_{A90,1hr}$
10:00	47.7	62.7	47.1	42.1
11:00	45.4		46.7	40.8
12:00	46.1		46.3	40.4

The derived daytime 16-hour and night-time 8-hour noise levels are 43.7 dB and 37.4 dB respectively.

3.2. ATTENDED INDUSTRIAL NOISE MEASUREMENTS

E3P conducted site walkovers during daytime and night-time periods along the eastern boundary of the site in order to ascertain potential sources of noise from the industrial manufacturing facility to the east. It was established that fixed plant sound was audible during the night-time periods at the eastern boundary of the proposed site. The fixed plant sound during the daytime period may have been present but was not audible over the general noise climate (i.e road traffic sound).

The following measurement positions were used during the survey:

- Noise Measurement Position 2 (NMP2): Located on the eastern boundary of the site close to Leadbrook Drive, with direct line of sight to the manufacturing facility. The microphone was located at a height of 1.5 m above ground level and in free-field conditions. The soundscape here was often dominated by distant road traffic from the A548 and use of Leadbrook Drive. Fixed plant noise was faintly audible during lulls in traffic and more pronounced during the night-time period when road traffic was minimal.

The surveys were conducted during the following time periods:

- 05:00-08:00 Tuesday 9th July 2024.

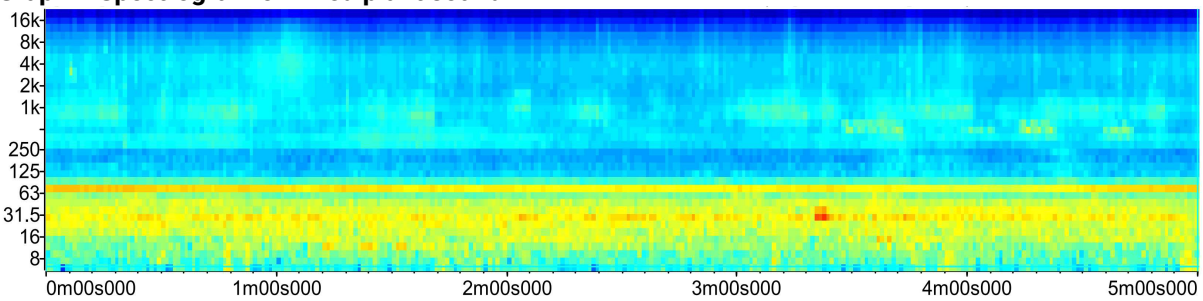
Table 4 provides a summary of measured values during this period:

Table 4 Summary of Measured Noise Levels for NMP2

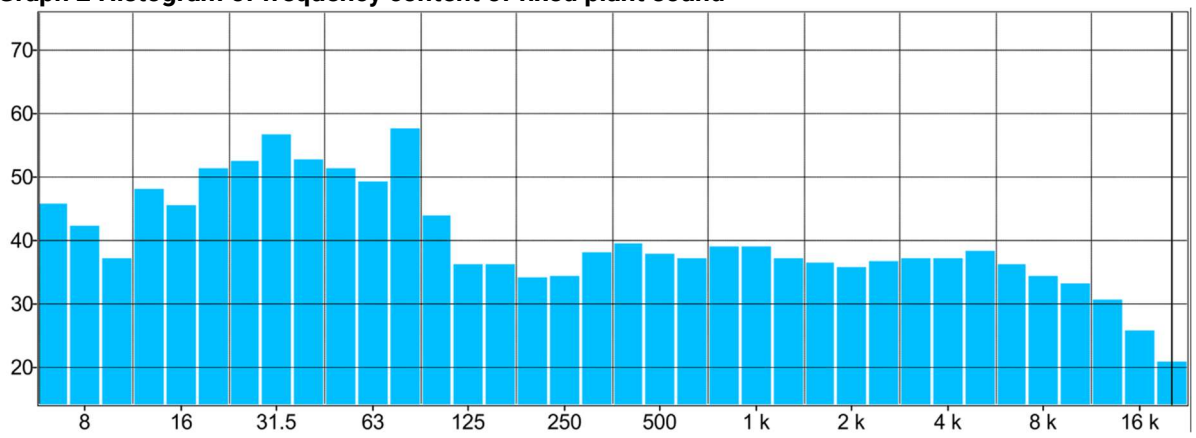
NMP	Time period	Measured Noise Level, $L_{Aeq,T}$ (dB)	Measured Background Sound Level, $L_{A90,T}$ (dB)	Commentary
NMP2	05:00-05:15	50.5	47.9	Minimal road traffic. Presence of fixed plant sound from manufacturing facility audible but not significant or highly noticeable. Wind through trees and birdsong present.
	05:15-05:30	50.0	47.9	
	05:30-05:45	50.6	49.1	
	05:45-06:00	52.3	50.1	
	06:00-06:15	52.3	48.8	Road traffic flows increase. Fixed plant sound becomes more difficult to perceive.
	06:15-06:30	54.3	49.5	
	06:30-06:45	53.6	50.0	
	06:45-07:00	49.9	47.4	
	07:00-07:15	49.9	46.5	
	07:15-07:30	51.3	47.1	
	07:30-07:45	52.9	48.7	
	07:45-08:00	53.7	49.6	

E3P have extracted the worst case 5 minutes of fixed plant sound from the above data set and in the absence of road traffic events. The below Spectrogram and Histogram show the frequency content of the fixed plant sound associated with the manufacturing facility. Given the distance of the manufacturing facility is over 250 m from the proposed development it was not possible to pinpoint the exact source of this sound. However, it is likely being generated from a vent or chimney stack that can be seen from the proposed site.

Graph 1 Spectrogram of Fixed plant sound



Graph 2 Histogram of frequency content of fixed plant sound



As can be seen from the above two graphs, the majority of the energy of the fixed plant sound is concentrated in the low frequency range. E3P will use a combination of a Noise Rating curve assessment and a NANR45 (low frequency noise assessment) to determine the impact of the fixed plant sound upon the proposed development. Where mitigation measures E3P will states these. This is considered the most appropriate assessment for this type of source given its overall low noise levels but with low frequency component.

The equipment outlined in Table 5 was used for the noise survey. The sound level meter was calibrated before and after measurements with no significant drift witnessed.

Table 5 Noise Measurement Equipment and Calibration Dates

Measurement position	Equipment description	Manufacturer & type number	Serial number	Calibration due date
NMP1 & NMP2	Sound Level Meter	01dB Fusion	12039	28/07/2025
	Pre-amplifier	01dB Pre22	1805124	
	Microphone	GRAS	330832	
	Calibrator	01 dB Cal31	87281	19/01/2025

4. NOISE IMPACT ASSESSMENT – INDUSTRIAL FIXED PLANT

E3P have found the presence of fixed plant sound associated with a nearby manufacturing facility. The nature of this sound sources is low in absolute noise level terms and difficult to perceive during daytime hours. It was found that fixed plant sound was no more than 49 dB at the worst affected eastern boundary.

However, this noise source carried a low frequency component. This source of sound, while potentially being present during the daytime was not significant against the surrounding traffic noise. It was only during the night-time period when traffic was minimal that this source of sound became audible.

As such, and given that occupants of the proposed development would be inside sleeping during night-time hours, consideration has been given to the frequency content of the sound. This has been done in two ways.

A Noise Rating Curve assessment, used to show that the frequency content in each octave band (63 Hz to 4 kHz) would meet NR30 inside the worst affected proposed dwellings with windows open.

Further to this NR assessment, the criterion within NANR45 (Procedure for the assessment of Low frequency complaints) has been used to demonstrate the likelihood of adverse impact within the worst affect dwellings with windows open. Where exceedances are noted, mitigation measures are recommended.

4.1. NOISE RATING CURVE ASSESSMENT

E3P have taken the worst case 5-minute period of the fixed plant sound, attempts to choose a period in the absence of other noise sources such as traffic or birdsong were made, however given the distance the manufacturing facility is away from the proposed site this was difficult.

The below assessment is used to demonstrate that at the worst affected prospered dwelling internal noise levels will be acceptable with windows open in relation to the NR30 criterion.

Table 5 Noise Rating Curve Assessment

Frequency (Hz)	31.5	63	125	250	500	1k	2k	4k	8k
Source Noise Level at nearest proposed dwelling, L_{Aeq} (dB)	57.7	56.4	43.4	39.7	43.1	43.1	40.3	40.6	37.6
Sound reduction of Open Window (dB)	13	13	13	13	13	13	13	13	13
Predicted Internal Noise Level, L_{Aeq} (dB)	44.7	32.9	22.6	20.4	25.8	25.9	22.2	22.9	24.6
NR30 (dB)	76.0	59.2	48.1	39.9	34.0	30.0	26.9	24.7	23.0
Difference +/- (dB)	-31.3	-15.8	-17.7	-13.2	-3.9	**+0.1**	**+0.4**	**+2.9**	**+1.6**

As can be seen in the table above exceedances were found in the 1 kHz to 8 kHz frequency range, on site perception of the frequency content is not in line with this exceedance given that fixed plant sound was observed to be low frequency in nature. The exceedances here are likely due to noise produced by the rustling of leaves by the wind which would have a higher frequency content than that of the fixed plant.

As shown in Table 5 above, internal noise levels within the low frequency range (500 Hz down to 31.5 Hz) are comfortably below the NR30 criterion, this is a positive indication that adverse impact would not be expected due to the fixed plant sound. However, given the frequency content containing the majority of its energy in the low frequency range, as shown in Graph 2, E3P have conducted a further low frequency assessment.

4.2. LOW FREQUENCY ASSESSMENT (NANR45)

E3P have conducted an assessment using the NANR45 Procedure for the assessment of low frequency noise. It should be noted that this procedure is mainly used for assessing complaints due to low frequency noise at already existing sites. However, the use of the criterion within the guidance is useful at demonstrating adverse impact due to the present of low frequency noise.

Table 6 NANR45 (Low Frequency Assessment)

Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
Source Noise Level at nearest proposed dwelling, L_{Aeq} (dB)	45.9	47.7	48.0	50.5	51.5	54.1	51.6	50.2	46.2	55.2	42.0	35.8	34.7
Sound reduction of Open Window (dB)	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
NANR45 Criterion (dB)	92	87	83	74	64	56	49	43	42	40	38	36	34
Difference +/- (dB)	-59.1	-52.3	-48.0	-36.5	-25.5	-14.9	-10.4	-5.8	-8.8	**+2.2**	-9.0	-13.2	-12.3

As can be seen in Table 6 above, with open windows there is a slight exceedance of 2.2 dB in the 80 Hz 1/3 octave band. As such, it would be necessary to recommend that windows are to remain closed. With windows closed and assuming standard glazing in in place (which affords approximately 21 dB sound reduction in the 80 Hz octave band) internal noise levels will be comfortably below the NANR45 criterion.

Given that windows need to be closed an alternative means of ventilation and mitigation of overheating should be provided. Further details on this are given in section 6.

It is worth noting that the median absolute noise level during the night-time period was noted to be 51 dB (between the hours of 05:00 and 07:00) at the eastern boundary. As such this would result in internal noise levels of approximately 38 dB internally with windows open. With windows closed, assuming standard thermal double glazing achieve 25 R_w+C_{tr}, internal noise levels would be 26 dB, 4 dB below the night-time criterion in BS 8233.

5. NOISE IMPACT ASSESSMENT – ROAD TRAFFIC

E3P have assessed road traffic sound to inform a thorough assessment. For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2023 MR1, to determine the impact of noise from road traffic sound.

The following inputs have been included in the model:

- Proposed Site Plan – Reference QRY-OAK-SP01 Rev D – Dated 10.05.22
- Leadbrook Drive is calibrated using NMP1.
- The A548 has been included within the model and is calibrated using road traffic count data taken from the Department for Transport government website. Measurements of this road were not taken as there is a large stand-off to the proposed development.
- 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 License v3.0. Finished floor levels of the proposed dwellings have also been included.
- Existing buildings are included.
- A reflection order of 2 has been used in all calculations.
- Noise levels generated using ISO 9613-1 and ISO 9613-2 "*Acoustics – Attenuation of sound during propagation outdoors*" as incorporated into CadnaA software.

Figures 3 and 4 determine the noise levels across the Site during the daytime and night-time periods, respectively, due to road traffic sound.

5.1. INITIAL SITE RISK ASSESSMENT

Figures 3 and 4 determine the noise levels across the Site during the daytime and night-time periods, respectively, due to all sources in accordance with the Welsh Government NECs.

The grids determine that, during the daytime periods, the worst-case plot is subject to noise levels of up to 53 dB which falls within NEC A. During the night, the worst-case plot would experience noise levels of up to 48 dB which falls within NEC B.

Only a handful of plots are within NEC B, closest to the main A road, with the majority within NEC A.

As such, noise should be considered when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.

Given the above, the assessment will ensure all appropriate criteria are achieved with mitigation measures recommended where required.

5.2. EXTERNAL AMENITY AREA NOISE LEVEL ASSESSMENT

The noise model has been used to predict noise levels in the shared amenity spaces which are to be used for relaxation. The predicted levels range from 37 dB and up to 52 dB in the worst affected external amenity areas. Therefore, noise levels achieve the lower criterion within the majority of plots and are below the upper criterion at all plots.

As such, it is predicted that all areas will have the no observed adverse effect level, which has 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.*

As such, no migration measures are required.

5.3. 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 which affords a sound insulation performance in the order of 29 dB R_W (C_t:-1;$C_{t,r}$ -4). The primary noise impact here is road traffic sound, as such, the $C_{t,r}$ correction is applied.

The model has been used to predict façade noise levels at all floor levels and orientations. 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 53 dB and 48 dB respectively. As such, standard thermal double glazing will be sufficient across the site.

It is also important to consider the maximum noise levels during the night-time period. Figure 6 has been produced using the 10th Highest maximum noise levels. The 10th highest maximum noise level along Leadbrook drive was found to be 62.7 dB. To consider a worst-case assessment no distance correction is applied, therefore the worst affected plots in relation to maximum noise levels have a level of 63 dB. As such internal noise levels with standard glazing in place would fall well below 45 dB internally achieving the criterion. As such, no plots will require higher specification glazing to mitigate maximum noise levels.

With regards opening windows, there is a requirement to consider the need to open windows for ventilation and the mitigation of overheating. At this stage, the assessment assumes that ventilation would be provided by way of extract fans in kitchens and bathrooms and openable windows.

5.3.1. 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.

5.3.2. 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 applies to bedrooms at night in relation to the average 8-hour noise level and 10th highest maximum noise level.

Given that the site is within a moderate risk location, as per guidance within Approved Document O the external noise limit threshold is 49 dB during the night-time ($L_{Aeq,8hr}$) and 64 dB more than 10 times a night ($L_{Af,max}$).

As can be seen from Figure 4 and Section 5.3, no plots experience an exceedance of the above criterion.

However, when considering the fixed plant sound from the manufacturing facility, detailed in section 4, E3P have demonstrated that with windows open certain facades would be subject to internal noise level in relation to low frequency sound and absolute noise levels that could cause adverse impact.

As such, a full overheating assessment in accordance with the guidelines indicated in Part O is required for plots located along the eastern boundary, see Figure 5 for the plots which will require this. This overheating assessment will provide these plots with an alternative method for the mitigation of overheating without the need for opening windows. Windows can still be openable for purge ventilation purposes.

A full overheating assessment should be carried out by a suitable qualified consultant.

6. MITIGATION

6.1. FAÇADE INSULATION AND VENTILATION

The previous section determined that a whole dwelling ventilation system in accordance with Part F would be installed across the site as it is assumed natural ventilation is not appropriate for these dwellings. Standard thermal double glazing has been demonstrated to be sufficient across the site.

Due to the presents of low frequency sound associated with the manufacturing facility, E3P have recommend that certain plots, indicated on Figure 5 in the appendix of this report, are subject to a full overheating assessment. This assessment should be conducted by a suitably qualified consultant and should allow for the provision of mitigation of overheating without the need for opening windows.

This is to protect future occupants from adverse impact in relation to low frequency noise associated with the manufacturing facility.

7. CONCLUSIONS AND DISCUSSION

E3P were commissioned by Castle Green Homes to undertake a Noise Impact Assessment for a proposed residential development at Quarry Farm, Oakenholt.

E3P has conducted attended measurements of the Leadbrook drive in accordance with the Calculation of Road Traffic Noise. Attended measurements of noise associated with the manufacturing plant to the east have also been conducted.

A 3D noise model has been constructed to assess road traffic sound impact across the site and incident upon all facades and floors and in any external amenity areas. Road traffic sound has been assessed in accordance with the criterion set out in in BS 8233:2014. Consideration has been given to noise present from the manufacturing plant.

The assessment determined that standard thermal double glazing will be sufficient across the site.

A whole dwelling ventilation system is assumed to be installed across the site as per approved document F. E3P recommend a full overheating assessment be conducted for certain plots in accordance with the guidelines indicated in Part O. This will allow for the provision of an alternative method of providing the mitigation of overheating without the need for opening windows and protect future occupants from fixed plant sound associated with the manufacturing facility.

With mitigation measures in place, this assessment has shown that no adverse impact is predicted day or night at the receptors due to road traffic sound or sound from the manufacturing facility.

END OF REPORT

APPENDIX I
LIMITATIONS

GENERAL

1. This report and any associated works (together comprising the "Services") were compiled and carried out by E3P for the client (as present in Section 1) under the E3P “Terms of Business” or with those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.

2. Unless explicitly agreed otherwise, in writing, this report has been prepared under E3P Standard Terms and Business as included within our proposal to the Client.

3. Project-specific appointment documents may be agreed upon at our discretion and a charge may be levied for both the time to review and finalise appointment documents and also for associated changes to the appointment terms. E3P reserves the right to amend the fee should any changes to the appointment terms create an increased risk to E3P.

4. The report needs to be considered in light of the proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

NOISE AND VIBRATION IMPACT ASSESSMENTS

5. 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.

6. 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.

7. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walkover inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects’ responses may not have been received from all parties. E3P cannot be held responsible for any disclosures that are provided post-production of our report and will not automatically update our report.

8. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, E3P reserves the right to review such information and, if warranted, to modify the opinions accordingly.

9. E3P does not warrant work/data undertaken/provided by others.

APPENDIX II
GLOSSARY

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 LAeq, LA90 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 7 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 8 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.
LAeq, T	LAeq 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.
LAmax	LAmax is the maximum A-weighted sound pressure level recorded over the period stated. LAmax is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall Leq 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 Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L10 is the level exceeded for 10% of the time and as such can be regarded as the "average maximum level". Similarly, L90 is the "average minimum level" and is often used to describe the background noise. It is common practice to use the L10 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.
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.

APPENDIX III
FIGURES

Figure 3 - Daytime Grid Noise Map (BS 8233) - Calculation at 1.5 m above ground level

Project:
Quarry Farm, Oakenholt

Project-No:
51-296

Client:
Castle Green Homes

Daytime Noise Level, LAeq, 16hr (dB)

- ... <= 48
- 48 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 56
- 56 < ... <= 58
- 58 < ... <= 60
- 60 < ... <= 62
- 62 < ... <= 65
- 65 < ...

Noise Map Objects

- Road
- Crossing
- Parking Lot
- Railway
- Building
- Barrier
- Receiver
- Calculation Area

e3p

Project Engineer: Scott Boughton
Date: 09/07/2024

Figure 4 - Night-time Grid Noise Map (BS 8233) - Calculation at 4.5 m above ground level

Project:
Quarry Farm, Oakenholt

Project-No:
51-296

Client:
Castle Green Homes

Night-time Noise Level, LAeq, 8hr (dB)

- ... <= 42
- 42 < ... <= 45
- 45 < ... <= 47
- 47 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 55
- 55 < ... <= 57
- 57 < ... <= 60
- 60 < ...

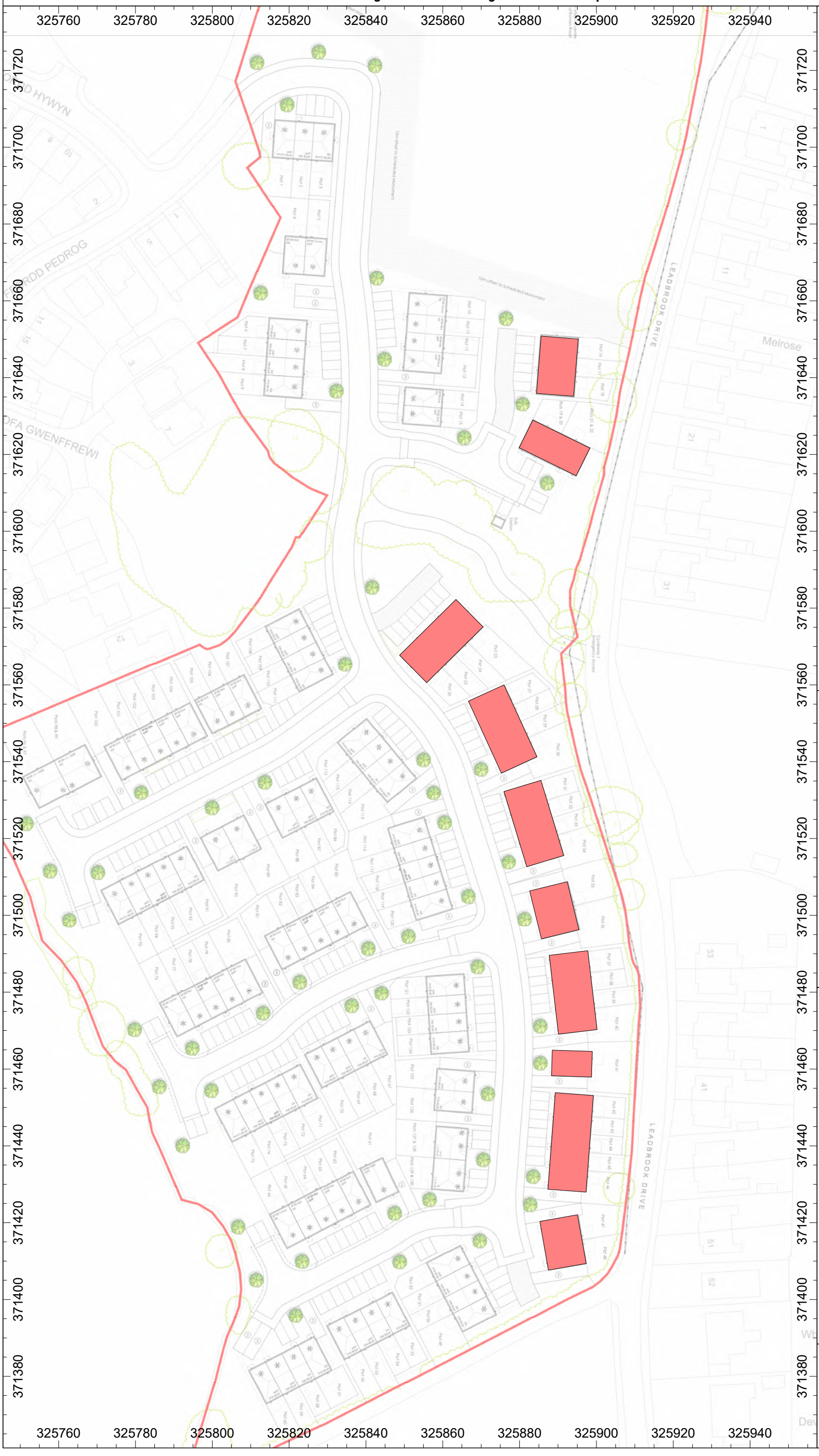
Noise Map Objects

- Road
- Crossing
- Parking Lot
- Railway
- Building
- Barrier
- Receiver
- Calculation Area

e3p

Project Engineer: Scott Boughton
Date: 09/07/2024

Figure 5 - Overheating Assessment Required



Project:
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